

TECHNICAL REPORT

*Privileged & Confidential
Prepared at Request of General Motors Counsel*

***Baseline Environmental
Site Assessment
Former Building 9
(Asylum Substation)
Delphi-Flint West Facility
Flint, Michigan***

General Motors Corporation
Worldwide Facilities Group -
Environmental Remediation and
International Environmental
Support

Detroit, Michigan

September 1998



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LIST OF ACRONYMS

ACM	Asbestos-containing materials
AST	Above-ground storage tank
ASTM	American Society for Testing and Materials
BBL	Blasland, Bouck & Lee, Inc.
BDL	Below detection limit
BLS	Below land surface
Brighton	Brighton Analytical laboratories, Inc.
CE	Consumer's Energy
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFC	Chlorofluorocarbons
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	Chain of Custody
DCE	Dichloroethene
DCV	Direct Contact Values
DQO	Data Quality Objectives
ECT	Environmental Compliance & technology
EPA	Environmental Protection agency
ERD	Environmental Response Division
ERIIS	Environmental Risk Information and Imaging Services
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
FOIA	Freedom of Information Act
gpd/ft	gallons per day per foot
gpd/ft ²	gallons per day per square foot
GCC	Groundwater Contact Criteria
GM	General Motors Corporation
gpm	gallons per minute
GSI	Groundwater/surface water interface
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HWS	Michigan Environmental Contamination List (hazardous waste sites)
IWWPTP	Industrial Wastewater Pre-Treatment Plant
LRST	Michigan Leaking Underground Storage Tank List
LUST	Leaking underground storage tank
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MERA	Michigan Environmental response Act
MSDS	material Safety Data Sheets
MTBE	Methyl tert butyl ether
NFRAP	No Further Remedial Action Planned
NPL	National Priorities List
NREPA	Natural Resources and Environmental Protection Act
OBG	O'Brien & Gere
OM	Operational Memorandum
PA	Public Act

LIST OF ACRONYMS

PAOC	Potential Area of Concern
PCB	Polychlorinated Biphenols
PPE	Personal protective equipment
ppm	parts per million
PSIC	Particulate Soil Inhalation Criteria
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance Quality Control
QAPP	Quality Assurance Project Plan
RAATS	RCRA Administrative Action tracking System
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RQ	Reportable Quantities
RST	Michigan Facility and Tank Data Report (Registered storage tank)
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act Of 1986
SIC	Soil Inhalation Criteria
SME	Soil and Materials Engineers, Inc.
SVOC	Semi-Volatile Organic Compounds
SWD	Solid Waste Division
SWF	Solid waste facilities
SWP	Soil Water Partitioning
TCE	Trichloroethene
TVA	Toxic vapor Analyzer
UCL	Upper confidence limit
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USPCI	United States Pollution Control, Incorporated
UST	Underground Storage Tank
USTD	Underground Storage Tank Division
VOC	Volatile Organic Compounds
VSIC	Volatile Soil Inhalation Criteria
WMD	Waste Management Division
$\mu\text{g/kg}$	micrograms per kilogram
$\mu\text{g/L}$	micrograms per liter

PART A - INTRODUCTION

1. Introduction

1.1 Purpose

This Baseline Environmental Site Assessment Report summarizes the results of an environmental site assessment and investigation work conducted at the former Building 9 and in the immediate surrounding areas (the Property) at Delphi-Flint West, General Motors Corporation (GM), located in Section 12, Township 7 North, Range 6 East, Flint, Genessee County, Michigan. This document is a compilation of all recent environmental assessment and investigation work completed at the site in anticipation of the sale of the parcel. The intent of this document is to summarize current environmental conditions at this parcel which will become the future Asylum Substation and establish a baseline of environmental conditions at the time that the future substation will be constructed and operated by others and separate current and future environmental liability.

1.2 Report Organization

The remainder of this report is divided into four parts. Part B includes the Phase I Environmental Site Assessment (ESA) prepared by BBL (1997). Part C includes the Phase II Environmental Site Investigation (ESI) conducted by BBL to confirm or deny the release of contaminants suspected based on the Phase I ESA and based on current and future land use. Part D includes an evaluation of a Supplemental Environmental Site Investigation conducted by Soil and Materials Engineers, Inc. (SME). Part E is an overall evaluation of the field data collected by BBL and SME. Figures and tables are included in the relevant Parts of this document.

1.3 Baseline Environmental Site Assessment Limitations

The conclusions reached herein are based on the limits of the investigation described in this report. BBL can offer no assurances and assumes no responsibility for Property conditions or activities that were outside of the scope of inquiry provided. In performing its investigation, BBL has used usual and customary practices, and has performed the scope of work by keeping within industry standards as defined in ASTM Standard Practice E 1527-97 and standard agency procedures, as appropriate. It is understood that BBL has relied on the accuracy of documents, oral information, and other material and information provided by sources documented in this report. BBL has analyzed the information obtained in this investigation, in keeping with existing environmental standards and enforcement practices, but cannot accurately predict what actions any given agency make take presently, or what standards and practices may apply to the subject Property in the future.

**PART B - PHASE I ENVIRONMENTAL SITE ASSESSMENT
SUMMARY**

1. Site Description

1.1 Property Description

The former Building No. 9 at Flint West was constructed in 1929 and was used as a machine shop. The machine shop evolved into a assembly line manufacturing plant. The major products manufactured at this plant were intake and exhaust engine valves. Throughout the history of the plant, processes associated with intake and exhaust engine valve manufacturing included forming, forging, grinding, plating, and heat treating. Figure B-3 shows the layout of the Property and the location inside the building where each process was carried out. The former plating area shown in Figure B-3 was operational from 1982 to 1991. An addition to Building 9 was constructed in 1971 and an overhang roof was added to the north storage area in 1986. The total area of the building was approximately 80,897 square feet. The building was undergoing facility decommissioning activities at the time of the 1996 Property inspections. Most manufacturing process machines had been removed in accordance with the facility deactivation plan.

Deactivation activities at Building 9 included removal of the machinery and wooden floor blocks, cleaning, filling, and concrete capping of trenches and sumps, and demolition of the plant building. There are no immediate plans for the land use after the Property has been deactivated.

Building 9 is bordered by industrial automotive manufacturing facilities to the east, southeast, north and west. To the immediate south is a parking lot. Residential homes are located beyond the parking lot to the south and southwest. Plant No. 38, a 326,000-square foot manufacturing facility, is located to the southeast of the Property.

The eastern face of building No. 9 has no windows or doors, and there are two small capped steel pipes of unknown use that extend approximately two inches from the wall. The south side of building No. 9 has no windows, doors, or protruding objects. The north side of the Property consisted of:

- A loading dock (Oils and greases in 55-gallon drums, grinding swarf disposal (non-hazardous) and waste metal chips from shearing)
- A 6,000-gallon hydraulic oil product aboveground storage tank (AST) within a secondary containment system (as discussed in Part B - Section 2.1.10.2)
- A stormwater collection sump and trench located in the loading dock area (Figure B-5). This stormwater collection sump and trench was connected to the industrial wastewater system. The industrial wastewater line exited the building just west of the electrical sub-station, transporting process wastewater through underground piping to GM's Flint West Industrial Wastewater Pre-Treatment Plant (IWWPTP) located west of former Building 5.
- A number of drums containing roofing tar, roofing paper, and sand were located in this area at the time of the 1993 Property inspection. The materials in these drums were used for miscellaneous roof repair. These drums were removed from the Property during facility deactivation.
- A stairway entrance was located in the central northern side of Building No. 9. A gravel area surrounded the stair entrance.

- An approximately 4-foot by 4-foot concrete pad, shown in Figure B-3, where a former drinking-water supply well was located. The former well, which is discussed in Part B - Section 2.1.13, was constructed in 1937 to a depth of 218 feet but has not been used since the 1950s.
- The facility exit points for industrial wastewater, steam, and compressed air pipes. These pipes run approximately 40 feet above the ground and proceed northwest from Building 9, across the railroad tracks and into Plant 8. These pipes will remain in place after the facility deactivation.
- Three steel and concrete pipes protruded from the north wall of building No. 9. Review of records and personnel interviews did not indicate that these pipes met the criteria of a PAOC. There was no staining apparent or any other environmental concern.
- A network of active railroad track lines and spurs located to the north-north west of the building.

The western face of Building No. 9 consists of the Property entrance, a garage door for large equipment and fork lift entrance, and a large tractor trailer loading dock capable of loading/unloading two tractor trailers simultaneously. A stormwater trench is located at the base of the loading dock.

1.2 Surrounding Land Use

Figure B-2 shows the land use in the vicinity of Building 9. Buildings associated with Flint West are situated along a one mile stretch of the Flint River. Previously, Flint West consisted of approximately 40 buildings, several of which have undergone closure and demolition. Buildings at Flint West range from a few hundred-square feet to more than 700,000-square feet in size. The surrounding properties associated with Flint West were developed for the manufacture and assembly of automobiles and automobile parts as early as 1915.

The Property is bordered to the east by Stevenson Street, which has a stormwater runoff gradient to the north towards the Flint river. Beyond Stevenson street is a large automobile parking lot. To the south side of Building 9 is an asphalt parking lot with stormwater runoff controlled by drains. The west side of Building 9 consists of railroad tracks and an asphalt/cobblestone road proceeding down a gradient towards the west.

The Flint River, in the vicinity of the Property, is controlled and contained within a concrete channel constructed in 1966 and 1967 by the United States Army Corp of Engineers. The concrete channel is bordered by parking areas and Facility support roads.

1.3 Topography

Property topography is affected by the proximity of Building No. 9 to the Flint River. The Property is located approximately one-tenth of a mile south of the river and approximately 756 feet above mean sea level. The Property was approximately 10 to 13 feet above the water level of the river at the time of BBL's Property visit. The topography on the Property is generally flat, but the surrounding land is sloped towards the Flint River. The Property is overlain with concrete and asphalt. A pumping and trenching system, designed to intercept stormwater generated from the north storage yard, pumps stormwater to the wastewater treatment system for the Flint West Facility. Inside the building, the floor is constructed of approximately 8 inches thick concrete, overlain in the past with wood blocks. The wooden floor blocks were removed during the facility deactivation.

1.4 Geologic and Hydrogeologic Settings

Pleistocene glacial drift overlays Paleozoic sedimentary rocks in the Flint area (Wiitala *et al.*, 1963). Pre-Cambrian igneous and metamorphic rocks of the Canadian shield form the bedrock upon which several thousand feet of sandstone, limestone, shale, and evaporites of the Michigan Basin have been deposited. The Flint area is located in the southeast portion of the basin.

Glacial drift of generally low hydraulic conductivity mantles the bedrock in nearly all parts of Genesee County. These deposits consist of clay, silty sand, gravel, and boulders. Hydraulic conductivity is highly variable in both the horizontal and vertical planes. Glacial deposits, in general, are an important source of water in Michigan. However, outwash plains and buried stream valleys are the most productive facies. The lacustrine deposits that are predominant in the vicinity of Flint have low permeabilities due to the abundance of clay (Wiitala *et al.*, 1963). Thin lenses of permeable sand and gravel yield adequate water for domestic use, but the primary source of groundwater in communities surrounding the Flint area is the Pennsylvanian Saginaw aquifer (Wiitala *et al.*, 1963). The City of Flint itself purchases water from the City of Detroit, which obtains water from Lake Huron (City of Flint Water Services, personal communication). The glacial deposits are approximately 50 feet thick in the vicinity of Flint (Genesee County Department of Public Health, personal communication). The top of the Saginaw formation lies between 600 and 700 feet above mean sea level MSL. The Property is approximately 756 feet above MSL.

In the vicinity of Flint, sandstones of the Pennsylvanian Grand River and Saginaw formations form the uppermost bedrock aquifer. Fractures greatly enhance the permeability of the sandstone beds. The thickness of the Grand River-Saginaw aquifer varies from 200 feet to 400 feet (Mandle and Westjohn, 1989).

Shale, siltstone, and thin-bedded sandstone intercalated with shale of the lower Saginaw formation serve as a regional confining unit separating the Grand River-Saginaw aquifer from the Parma-Bayport aquifer (Wiitala *et al.*, 1963). The Late Mississippian Bayport Limestone and the Early Pennsylvanian Parma Sandstone Member of the Saginaw formation make up the Parma-Bayport aquifer. The Bayport Parma aquifer is not used as a source of water in the vicinity of Flint (Westjohn and Weaver, 1996).

The Mississippian Michigan formation lies beneath the Saginaw formation. The upper portion is composed of shale, thin-bedded limestone, dolomite, gypsum, and anhydrite, and separates the Parma-Bayport aquifer from the Marshall aquifer (Mandle and Westjohn, 1989). Sandstones in the lower portion are hydraulically connected to the Early Mississippian Marshall Sandstone below and compose the Marshall aquifer. The thickness of the Michigan formation averages around 100 feet in the vicinity of Flint (Wiitala *et al.*, 1963).

The Marshall formation is present in most of Genesee County. It consists primarily of sandstone, with some beds of conglomerate, shale, and dolomite. Thickness varies from over 200 feet in the northern part of the county to 70 feet in the south. In some places, the Marshall, Michigan, and Saginaw formations form a single aquifer (Wiitala *et al.*, 1963).

The Early Mississippian Coldwater Shale forms the base of the aquifer system and ranges in thickness from 500 to 1,100 feet.

1.4.1 Site Specific Geology

An eight-inch-thick layer of concrete was present across most of the property. The geology beneath the Property was characterized from soils collected during the installation of soil borings and monitoring wells. Sands, silty

sands, and clayey sands were present beneath a layer of fill that included coal and metal shavings. The water-table in this area lies approximately 10 to 20 feet below land surface (BLS), depending on the distance from the Flint River. During the field investigation, the depth to the water table ranged from 12 to 20 feet BLS.

The State of Michigan Act 451 Part 201 Administrative Rules (R299.5101(c)) and the Code of Federal Regulation (CFR, Part 40, Section 149.2) define an aquifer as "... a geological formation, group of formations, or part (portion) of a formation that is capable of yielding a significant amount of ground water to wells or springs." The thin surficial water bearing unit at the site has a very low transmissivity [10^{-4} to 10^{-5} centimeters per second (cm/sec)] and does not meet the definition of an aquifer for the following reasons:

1. The unit does not yield enough water for it to be considered an economically viable water source; and,
2. The natural water quality of the surficial water-bearing unit is highly mineralized and is such that extensive treatment would be required prior to use.

The practical definition of an aquifer is further clarified in the book *Groundwater and Wells* as "a saturated bed, formation, or group of formations which yields water in sufficient quantity to be economically useful (Driscoll, 1986)." From an economical standpoint, wells that yield less than approximately 2 gallons per minute (gpm) are not useful as water supply. Site-specific data collected from the Flint West facility was input into the Cooper-Jacob equation to estimate sustainable flow from the surficial water-bearing unit, as follows:

$$Q = \frac{s T}{264 \log 0.3 \frac{Tt}{r^2 S}}$$

Where Q = pumping rate, gpm

T = transmissivity, gallons per day per foot (gpd/ft) = K*b

K = conductivity, gpd/ft² = 4.2

(site data, BBL, June 1997)

s = drawdown, feet = 5

r = distance from pumping well, feet = 5

t = time since pumping started, days = 365

b = saturated thickness, feet = 5

S = storage coefficient, dimension less = 0.15

$$Q = \frac{5 \times 21}{264 \log 0.3 \left(\frac{21 \times 365}{5^2 \times 0.15} \right)} = 0.14 \text{ gpm}$$

This projection was verified by data from short-term pumping at monitoring wells installed for leaking underground storage tank (LUST) investigation at the nearby Building 2A (ES&E, January 8, 1992). Results of a step drawdown test indicated that 1 gpm was the maximum sustainable pumping rate for the pump test. This information further supports the determination that the surficial water-bearing unit cannot be considered an aquifer.

A review of well completion records from Genesee County indicated that potable wells in the area are open to the Saginaw sandstone below the glacial deposits.

In addition, and as added emphasis, there are several institutional reasons that this water unit could not be used as a potable aquifer, namely:

1. Other much more productive and economically viable aquifer sources are readily available in the area;
2. The surficial medium-to-fine grained sand unit is highly variable in thickness, and is not thick enough to support the amount of casing required by the State of Michigan Department of Health for public potable water supply wells (25 feet) throughout much of the Flint West property. State regulations (Michigan Drinking Water Regulations, R 325.10818) require that casings for potable water supply wells extend at least 25 feet BLS.;
3. The Genesee County Health Department will not issue permits for public potable water supply wells within the Flint City limits; and,
4. Potable water is readily available throughout the Flint area from the municipal utility and hookup is mandatory.

Representatives of the Genesee County Health Department (personal communication) stated there were no public potable water supply wells drilled to tap the glacial drift since 1967, when records were first required. Personnel from the City of Flint Water Services stated that hookup to the municipal water supply is mandatory within City limits (Flint City Code, Section 46-25).

Based on groundwater elevation data collected on July 20, 1996 (after one week of little or no precipitation) and August 4, 1996 (within 24 hours after a 48 hour rain event) groundwater flows primarily towards the Flint River [O'Brien & Gere (OBG), 1996]. This data concurs with additional file reports on the surrounding area, that documented a groundwater flow direction towards the Flint River. The water table in the area lies approximately 4 to 16-feet BLS, depending on the distance from the Flint River.

1.5 Hydrology

Historically, stormwater runoff was collected in catch basins from the parking areas and roof drains and was transferred by storm sewer lines through stormwater outfalls to the Flint River (Figure B-5). According to Facility personnel, previous operations involved the collection of stormwater runoff from the western portion of the roof and other areas in which oil and other contaminants accumulated. This stormwater was transferred by a separate industrial process water sewer system to the IWWPTP. The sewer system connecting to the IWWPTP exits Building 9 approximately 15 feet west of the electrical sub-station (Figure B-5).

Facility personnel indicated that after the demolition was completed, approximately one-third of the roof conductors were converted to catch basins and the remainder were plugged. The catch basins were connected to the stormwater system that discharges to the Flint River.

1.6 Surface Water

As previously noted, the Flint River lies to the north of the Property and is controlled and contained within a concrete channel. The channel was constructed in 1966 and 1967 by the United States Army Corps of Engineers for flood control. The channel is bordered by a railroad spur, an electrical substation, Building 37, parking areas, and support roads for the Property. Schwartz Creek lies to the east and south of the Property and is a tributary to the Flint River.

1.7 Historical Land Use

Based on a review of historical Sanborn maps dated 1909, 1914, and 1928, the Property was a residential area prior to the construction of the plant. Since 1929, engine exhaust and intake valves were manufactured at the building. The following are the processes that have been conducted at Building 9 (Environmental conditions are discussed for each process in the sections noted in parentheses.):

1. Forging (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.1)
2. Plating (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.2)
3. Degreasing/parts cleaning system (Part B - Section 2.1.3)
4. Process wastewater collection and transport systems (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.4)
6. Lubrication sumps and systems (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Sections 2.1.7 and 2.1.8)
7. North Storage Lot Stormwater Recovery System (Part B - Section 2.1.11.5)
8. Grinding/Forming (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.7)
9. Lubricating Oils and Recycling System (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.7.2)
10. Welding, Forming, and Heat Treating Areas (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.8)
11. Soluble Lubricating Oils Treatment and Recycling System (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.8.2)
13. Tumblers (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.9)
14. Hydraulic oil systems (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.10.2)
15. Air pollution treatment systems (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.14.)
16. Heat Treating (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.15.)
17. Waste management procedures (No environmental conditions of concern related to this process were noted during the site inspection, Part B - Section 2.1.16.)

Figure B-3 shows the location where each process was carried out inside the building.

Since 1929 the Property operated as an engine intake and exhaust valve manufacturing facility. The nature of the industry and associated industry growth, especially in the last few decades, has created an extensive list of both raw materials and lubricating, treatment and degreasing chemicals. This is documented by the Material Safety Data Sheet (MSDS) library for Building No. 9, which is located in Plant 7.

1.8 Historical Aerial Photograph Review

To obtain a historical perspective of the Property, a review of historical aerial photographs was conducted. Aerial photographs from the years: 1965, 1971, 1977, 1986, and 1991 were obtained from the City of Flint Property Assessor's Office, and reviewed.

1965 Aerial Photograph

Across Glenwood Avenue to the south of the building are residential areas. To the east, north, and west are the manufacturing buildings of the facility. Railroad tracks run along the north and west borders of the Property. To the north across the tracks is what appears to be a storage lot. Approximately 150 feet beyond the storage lot lies the Flint River.

1971 Aerial Photograph

The street to the south of the building was open to traffic. Beyond the street are residential homes. Storage of 55-gallon drums can be seen in the north storage area and in the area adjacent to the railroad tracks and west of the existing building. Approximately 100 feet to the north of the building are three ASTs, with a volume approximately in the range of 5,000 to 10,000-gallons. A network of railroad lines and spurs extend along the north edge of the building and curve towards the southwest at the western end of the building. Stevenson Street parallels the eastern side of the building. Beyond Stevenson street is a large parking lot.

1977 Aerial Photograph

The street to the south of the building has been diverted to the south, thereby providing space for a triangular shaped asphalt parking lot. The west side of the building has an addition which covers approximately 20,000 square feet. Storage of 55- gallon drums is apparent in the north storage area.

1986 Aerial Photograph

The north storage area has a roof extending to the north of the building. Storage of 55-gallon drums is apparent on the north area lot. Two ASTs are visible approximately 100 feet to the north of the Property. Based on a review of the aerial photograph and interviews with Property personnel, these ASTs do not meet the definition of a PAOC.

1991 Aerial Photograph

The Property appears unchanged as compared to the 1986 aerial photograph. Two silos are visible approximately 100 feet to the north of the Property. In general, the areas adjacent to the Property are overlain with asphalt and/or concrete.

1.9 Site Features and Historical Facility Operations

At the time of the 1993 site inspection, the GM, AC Rochester Division, Flint West Facility, Building No. 9 was an 80,897-square feet manufacturing plant. The facility contained several groups of operating assembly line type machinery systems. These systems were all grouped into areas associated with the lubricating, quench, or cutting oils required for the operation of the machines (Figure B-4). Throughout the machinery areas, the floors were

saturated with petroleum products and other oils utilized in the operations of the facility. Various sumps existed beneath the hot forge presses for oil collection and machinery repair.

A quench oil system was located in the blast furnace area for emergency quenching. This fire suppressant system consisted of a sump and a quench oil storage tank located beneath the sump.

An electrical sub-station room was located at the northwest perimeter of the building. This was the only transformer location on site. The transformers contain polychlorinated biphenyls (PCB) oils as defined in 40 Code of Federal Regulations (CFR) 761 as PCB transformers. PCB transformers are discussed in detail in Part B - Section 2.2.4.1. Capacitors also existed throughout the building and are discussed in detail in Part B - Section 2.2.4.2.

Throughout the building, steel lined trenches directed soluble cutting oil and a petroleum based lubricating oil to sumps. The trenches varied in depth from 4 feet to approximately 17 feet below grade. These sumps were designed to collect and recycle used cutting fluids and lubricating oils. Figure B-4 shows the layout of the trenches and sumps in the building. The trenches are discussed in detail in Part B - Section 2.1.7.2 and 2.1.8.2.

An additional system of steel lined trenches was present throughout the plant. These trenches collected water and liquids that were released to the plant floor and transported them from the main sump located on the eastern inside of the building to the wastewater treatment plant located adjacent to Building 5 (Figure B-2). The collected fluids are treated and discharged to the City of Flint sewer system. This trench system extended into the waste storage area on the north side of the Property where stormwater runoff was collected and directed to the wastewater treatment system. Figure B-5 shows the layout of these trenches and they are discussed in Part B - Section 2.1.11.3.

Chemicals and supplies were transferred from a central shipping and storage location in the Flint West facility to Building No. 9 and were stored inside the loading dock on the southwestern part of the building as shown in Figure B-3. These materials were then transported to the appropriate area for use. Non-hazardous wastes that were generated from the plant processes (i.e. waste oil, metal chips, and grinding swarf) were drummed and placed at the north side loading area, shown in Figure B-3, and then transported to the storage shed at "17 yard," which is located between Buildings 13 and 17. Waste material was stored there (for less than 90 days) prior to off-site shipment to a recycling, disposal, or destruction facility. An oil crib (oil container storage), hydraulic oil AST, and oil AST were also located in the north side loading area as shown in Figure B-3.

Electrical power, wastewater, steam, and compressed air pipelines entered and exited the facility from the northwest side of the building and were distributed throughout the building. These pipelines also connect to Plant No.38 through an underground tunnel located southeast of the Property.

The sump location for the industrial wastewater pumping station was situated so that malfunctions of the wastewater pumping system would overflow into an adjacent stormwater sump, which ultimately discharges into the Flint River. This connection was plugged in 1995.

At the time of BBL's June 1996 site inspection, the building was undergoing deactivation procedures. Operations had ceased and most of the equipment and machines had been removed. In 1995, The Best Group, Inc. was hired by GM to complete the environmental deactivation and demolition, and The Traverse Group was retained to perform oversight of these activities.

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*Privileged & Confidential
Prepared at request of General Motors Counsel*

Deactivation and demolition included removal of asbestos containing materials, mercury containing lights and apparatuses, cleaning of sumps, tanks, floors, pits, and sewers, removal of wood block flooring, and containerizing hazardous and non-hazardous materials for disposal or recycling. Specific deactivation and demolition activities are discussed in Part B - Section 2.2.

2. Environmental Conditions

The following discussion of environmental conditions was derived from observations made and information collected and reviewed while performing this Environmental Site Assessment. In addition, recommendations are provided regarding specific Property conditions that meet the definition of a PAOC, as defined in Part A, Section 1.1.

This section is divided into three main parts: processes (Part B - Section 2.1); deactivation activities (Part B - Section 2.2); and general areas (Part B - Section 2.3).

Part B - Section 2.2 discusses deactivation and cleaning procedures. As a general note, deactivation cleaning included high pressure washing with a detergent solution. Wash water and rinsate were collected and directed to the IWWPTP at Flint West. Any further specific decontamination activities are discussed in each section, as appropriate¹.

2.1 Processes

This section includes discussion of the various manufacturing processes conducted at Building 9.

2.1.1 Forge Press Pits

The forge press pits were located on the northern side of the building, as shown in Figure B-3. The pits were used to collect metal chips generated during operation of the presses. The pits are approximately eight feet deep and range from approximately three feet to six feet wide. These pits were connected to the oil sump which pumps the oil back to the forge presses for re-use.

During the June 1996 Property visit, the presses had been removed and the cleanup of the press pits had not yet begun, but decontamination was completed in 1996. The press pits were inspected on October 9, 1996, after decontamination and there was no visual evidence of release to the subsurface soils. The press pits have been filled with sand and capped with concrete as part of facility deactivation activities.

Because there is no known or documented release that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.2 Former Chrome Plating Area

According to Property personnel, a chrome plating operation was conducted in the building from 1982 to 1991. The former location is shown in Figure B-3. The MDNR uniform hazardous waste manifests obtained from plant personnel indicate that approximately 3,000 gallons of reportable quantity (RQ) hazardous waste, ORM-E NA9189 (EPA D007) were transported off-site each week. The records file search revealed that the chrome plating system was decontaminated by scraping and pressure washing. The system was dismantled between March 20, 1990 and October 13, 1991. Equipment and debris were placed in roll-off containers, while decontamination liquids and process wastes from the sumps were placed in drums. The clean-up and disposal of the plating area required 19

¹Reference to "proper disposal" of wash waters means that they were directed to the IWWPTP.

months to complete. Clean closure or clean verification samples were not collected for this area. Interviews with facility personnel indicated that the sumps appeared competent at the time of decontamination.

A discharge notification form dated June 15, 1990 documented the release of approximately 1 pound of chromic acid waste from a gondola onto the pavement and into a storm sewer catch basin. Samples were collected downgradient and upgradient of the spill in the storm sewer system and the results indicated some quantity did overflow the basin. Liquid waste was pumped from the basin into containers and transported off site for disposal. The release was followed by a limited investigation which did not detect chromium in soils at the outflow point.

Because there is no known or documented release at levels that would pose an unacceptable risk to human health or the environment, this area does not meet the definition of a PAOC.

2.1.3 Former Trichloroethylene Degreasing Unit and Sump

Trichloroethylene (TCE) was used as a vapor degreasing solvent in the former degreasing area which is shown in Figure B-3. An internal GM memorandum stated that the TCE spill entered the wastewater treatment system and Property personnel notified the City of Flint. The wastewater treatment system was reportedly self contained. The sump was pumped out periodically and the waste was disposed of off site.

BBL did not locate information that indicated that the sump was clean closed, but during facility deactivation. The area was high pressure washed with an aqueous degreasing agent.

In a report documenting removal of an underground storage tank (UST) and petroleum contaminated soils, low levels of TCE were reported in the groundwater 150 feet downgradient from Building 9. The TCE source is unknown. Due to the existence of TCE downgradient from known TCE operations and a documented release, BBL considers this area a potential source of TCE in groundwater, and is, therefore, considered a PAOC.

2.1.4 Quench Oil Systems

2.1.4.1 Quench Pits Dump Tank

Quench oil was used to cool steel valves as the valves exited the heat treating area (Figure B-3). The sump system was used to manage the quench oil, but was not in operation at the time of BBL's site inspection. No known releases from the sump were discovered by BBL. The integrity of the sump could not be evaluated because the sumps were full of aqueous and oil based liquids. During and after facility deactivation (discussed in 2.2) the sump was inspected and found to be intact with no evidence of cracks that would constitute a PAOC. Facility personnel indicated that during the course of operation of this system, no notable volumes of these oils were required to fill the system, and no substantial mass balance shortfalls occurred. Because there is no known or documented release at levels that could pose unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.4.2 Fire Hazard Dump Tank

A 3,000 gallon steel dump tank was present below the sumps in a sub-grade room in the north central part of the building. The dump tank was used to contain quench oil for emergency purposes. In the event of a fire, quench oil would be pumped from the tank to suppress the fire. Since the tank was not buried but free standing within the room, it is not considered an UST and, therefore, is not registered.

During inspection, the tank was found to be intact and no leaks were noted. Because there are no known or documented releases at levels that would pose an unacceptable risk to human health or the environment, this area does not meet the definition of a PAOC.

2.1.5 Exhaust Forge Presses Area

The exhaust forge presses utilized a system of sumps below the presses to recycle lubricating oils. Prior to entering the presses, the parts were sprayed with oil. Some of the oil would drip back into the sumps. The sumps were inspected on October 9, 1996, and there was no visual evidence that a release to the environment had occurred, and no documented releases to the environment were discovered.

Because there is no known or documented release at levels potentially dangerous to human health and the environment, the sump does not meet the definition of a PAOC.

2.1.6 PCBs

PCBs may be present in transformers, capacitors, or in hydraulic fluids at GM plants. Typically they are not found or associated with other material or processes. This is consistent with findings at other buildings at Flint West.

2.1.6.1 Transformers

The electrical sub-station (pump power room) contained the only PCB transformers located at the Property. The transformers were labeled and the floor was sealed to contain possible spills or leaks and appeared competent. The room had two doors that open to stairs leading north onto a gravel area (Part B - Section 2.3.2.1). Oil puddles were observed on the floor at the base of the stairs leading into the power room. The power room was approximately three feet below average plant grade. Plant personnel explained that "minimal amounts" of oil occasionally overflowed from the sumps associated with the exhaust forge presses area into the pervious gravel area.

On the inside of the southern wall, at and below the normal plant grade, oil was observed seeping through cracks in the wall. The seepage did not appear to be associated with the transformers, but rather with the grinding/ welding oil sumps. Because there is evidence of oil below the floor to the south of the pump power room (where the welding systems were located), this area should be investigated further. By the time of the property walk through on October 9, 1996, the cracks in the wall had been patched and painted.

The visual evidence of a release in this area demonstrates that this area meets the definition of a PAOC, and will be discussed further in Part B - Section 4.

2.1.6.2 Capacitors

According to review of records and interviews, there were no PCB-containing capacitors at the Property.

2.1.6.3 Hydraulic Fluids

Hydraulic fluids used at the Property did not contain PCBs, according to files reviewed and interviews.

2.1.7 Grinding/Forming Areas

2.1.7.1 Equipment

Grinding equipment was located in the southern and central part of the former building, as shown in Figure B-3. Equipment included mechanical grinders that used oil as a lubricant in the grinding process.

2.1.7.2 Oil Sump and Trench System

The oil based trench system distributed, collected, and recycled grinding and welding oils during the operation of the facility. The trench system appeared to be in good condition, although the integrity of the trenches and sumps could not be inspected in June 1996 because the systems were in use and the sumps had oils in them. The oil observed seeping through cracks in a wall of the electrical sub-station could be from leakage from this system. Due to the nature of the system, volume controls were not utilized to monitor potential leakage of the systems to the environment.

An inspection conducted by BBL personnel on October 9, 1996, revealed that the concrete trenches were lined with steel. Due to the steel lining, integrity of the concrete in the trenches could not be determined. Some of the trenches also contained water and debris. The steel appeared sound, but there were gaps between several of the welded joints. BBL personnel also noted that at land surface there was approximately a one-inch gap between the steel lining and the concrete trench, i.e. the steel is not flush against the side of the concrete trench. Because there is no known or documented release at levels potentially dangerous to human health and the environment, this area does not meet the definition of a PAOC.

Because there is no known or documented release that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.8 Welding, Forging and Heat Treating Areas

2.1.8.1 Equipment

Equipment was located in the northern part of the former building, as shown in Figure B-3. This process used a soluble oil as a lubricant.

2.1.8.2 Sump and Trench System

The soluble oil trench system distributed, collected, and recycled lubricants during the operation of the facility. The trench system appeared in good condition, although the integrity of the trenches and sumps could not be inspected because the systems were in use in June 1996 and contained liquid. Due to the nature of the system, volume controls were not utilized to monitor potential leakage of the systems to the environment.

An inspection conducted by BBL personnel on October 9, 1996, revealed that the concrete beneath the steel trenches were lined with steel. Due to the steel lining, the integrity of the concrete in the trenches could not be determined. Some of the trenches also contained water and debris. The steel appeared sound, but there were gaps between several of the welded joints. At land surface there was approximately a one-inch gap between the steel lining and the concrete trench (i.e., the steel is not flush against the side of the concrete trench).

Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.9 Tumblers

The tumblers were located at the central-northern part of the former building and were used to mechanically remove metal burs from metal parts. The metal dust that was generated by this process was transferred to the grinding swarf disposal system. The tumbler room, as shown in Figure B-3, had a concrete floor with expansion joints that appeared in good condition at the time of the walk through. The tumblers have been removed from the room and the room was demolished along with the rest of the building.

Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.10 Tanks

2.1.10.1 Underground Storage Tanks

In 1985 a 6,000-gallon hydraulic oil UST located in the North Storage Area was removed and replaced with an AST (discussed in the next section). The UST was located in approximately the same location as the AST (prior to removal during facility deactivation). Prior to 1986, registration of USTs was not required, so there is no documentation on the UST excavation. Discussions with facility personnel indicated that the excavation was completed successfully and that there were no releases to the environment observed during tank closure.

Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.10.2 6,000-Gallon Hydraulic Oil Aboveground Storage Tanks

A 6,000 - gallon hydraulic oil AST was located in the north storage area within a concrete secondary containment system and adjacent to the north wall of Building 9. The hydraulic oil AST was periodically filled by tanker truck. The hydraulic oil was pumped through aboveground pipes into the building, where personnel dispensed the oil into drums or containers for use throughout the forging, grinding, and forming areas. The tank was properly labeled and did not require registration with MDEQ because the tank did not contain more than 1 percent of a critical compound as defined in MDNR's Critical Materials Register dated January 1, 1994. Based on visual inspections by BBL, the secondary containment system appeared competent. In September 1996, the system was cleaned by pressure washing with liquid detergent and removed from the Property. According to plant personnel, no evidence of spillage was noted during the removal of the AST system.

Because there is no known or documented releases at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.11 Sewer Lines

2.1.11.1 Storm Sewers

Figure B-5 shows the locations of storm sewer lines at the Property. The storm sewers direct stormwater to outfalls located on the Flint River. Stormwater collected in the North Storage Area is piped to the industrial wastewater system, as discussed in Part B - Section 2.1.11.5.

2.1.11.2 Sanitary Sewers

Sanitary sewers beneath the building collect sanitary wastewater through dedicated lines and direct it to the City of Flint sanitary sewer system.

Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.1.11.3 Industrial Process Lines

Figure B-5 shows the layout for industrial wastewater process lines beneath the building. The lines directs industrial wastewater to the to the main sump located at the northwestern end of the building. From the main sump, industrial wastewater is pumped to the facility-wide IWWPTP for pre-treatment and processing prior to discharge to the City of Flint sanitary sewer system.

2.1.11.4 Stormwater Discharge Point Located Adjacent to Industrial Wastewater Sump in the Northeast Corner of the Building

A documented release to the stormwater system occurred on August 19, 1991. A pollution overflow system within Plant 9 caused a discharge of oily material to the City of Flint storm sewer because the flow exceeded pump capacity. A sheen approximately 20 feet wide extended about a half mile down the river. Apparently, the wastewater treatment system sump pump was not adequate to handle the wastewater flow rate (presumably due to rainwater). Samples of the outfall water were collected and laboratory analyses did not indicate elevated levels of contaminants.

The pipe leading to the stormwater system from the process wastewater sump was plugged in 1995. The pump was decontaminated and removed. The sump was pressure cleaned, and the fluids were pumped out and disposed of off site. The sump was then backfilled and capped with cement. Because the storm sewer system channels stormwater to the River, and therefore prevents contact of potential contaminants with the environment, this area does not meet the definition of a PAOC.

2.1.11.5 North Storage Area Stormwater Pump and Sump

This pump and sump system was designed to collect overland runoff in the north storage area and pump this water to the pollution wastewater system. During BBL's walk through in 1994, rainwater on the surface exhibited a petroleum sheen, indicating the need to treat overland runoff.

On May 14, 1993, a MDNR report of oil, salt, or polluting material losses form was filed. The form indicted that the stormwater pump in the north storage area became uncoupled and approximately 50-100 gallons of oil overflowed the trench at the northeast corner of the area and flowed onto Stevenson Street. The form indicated the

oil also flowed onto the railroad tracks and ran east along the tracks (along natural drainage paths to the north and east) a distance of 75 to 100 feet.

At the time of BBL's 1993 site inspection, a sump pump failure was discovered and a small amount of oil was noticed overflowing onto Stevenson Street. No evidence of a release was observed or noted during BBL's October 9, 1996 inspection.

Because oil was released to a pervious (gravel) area along the railroad tracks, oil may have permeated to the underlying soil and groundwater. The release of substances at levels that could pose an unacceptable risk to human health and the environment may have occurred. This area meets the definition of a PAOC, and is discussed further in Part B - Section 4.

2.1.12 Pits, Ponds, and Lagoons

There are no pits, ponds, or lagoons associated with management of liquid or solid wastes at the Property. There was a sub-grade structure that contained the fire hazard dump tank (2.1.4.2) that was referred to as a pit by the demolition contractor. Part B - Section 2.1.4.2 discusses this area.

2.1.13 Groundwater Wells

On August 3, 1937, an 8-inch diameter potable water well was installed to a depth of 218 feet below land surface (Figure B-3). Records from MDEQ indicated that the well was constructed with steel casing to a depth of 52-feet bls. This well has not been used as a source of water since the 1950's. On November 13, 1991, a black oily film was observed on the pump intake pipe. Subsequently, 11.5 feet of unknown petroleum product was measured in the well. The source of the product is not known, but vandalism was suspected. The product was not in contact with the surrounding geology because of the solid casing. The petroleum product was pumped out of the well and the well was purged. Subsequent analysis of groundwater samples from this well by EPA Methods 8260 and 8270 indicated that concentrations of Volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) were below detection limits. A well closure report in the GM files indicated that the well was grouted with 85 bags of neat cement on July 7, 1992 and was properly abandoned.

The documentation indicates a release may have occurred into this well; however, analytical data indicates that VOC or SVOC impacts were not present in the water contained in the well. Therefore, since there were no documented releases at levels that would pose an unacceptable risk to human health and the environment and this well has been closed, this area does not meet the definition of a PAOC.

2.1.14 Air Pollution Treatment Systems

The property maintained air pollution permits for various operations at the building. Eight air permits were formerly required for plant operations at Building 9, including:

<u>Permit No.</u>	<u>Equipment Description</u>
30-78A	Shot Blast Dust Collector
358-90	Inlet Forge Wet Scrubber
452-75B	First Stem Collector
454-75C	Exhaust Forge Wet Scrubber
455-75A	Tip Harden Mist Collector

456-75A	Seat Gr Mist Collector
457-75A	Finish Stem Gr Mist Collector
785-77A	Multiform Mist Collector

Permits were required for emissions from collectors of (1) oil mists from coolants applied during grinding processes, (2) smoke and fumes generated during quenching, (3) smoke and mist generated during application of lubricants, and (4) scale and dust generated from steel shot directed at rough valve forgings during tumbling action. Information from facility files indicates that all permits were in order and GM was in compliance with all applicable regulations. There were no environmental issues identified relating to this process that would constitute PAOCs at the Site.

2.1.15 Heat Treating

The facility heat treated metal components such as valves to temper the metal. Heat treating was conducted in the central to northeastern part of the facility, as shown in Figure B-3. The metal was heated to various temperatures depending on the component and application. There were no chemical releases identified as environmental issues in this area, therefore this area does not meet the definition of a PAOC.

2.1.16 Waste Management Procedures

The general procedure for waste management at the Property was to containerize solid waste in rolloffs or DOT-approved 55-gallon drums upon generation. Waste was then temporarily stored (less than 90 days) at the north storage area until it was either transported offsite by United States Pollution Control, Incorporated (USPCI) for proper disposal or transferred to the storage shed at "17 yard," which is located between Buildings 13 and 17. Waste materials were stored there (for less than 90 days) prior to offsite shipment to a recycling, disposal, or destruction facility. Wastes appeared to be characterized and managed appropriately. Accordingly, there were no environmental issues identified related to this process.

2.2 Deactivation Activities

In preparation for facility deactivation, an assessment of the Building 9 was conducted to determine what type of deactivation and decontamination activities were required. The objective of this assessment process was to evaluate the building structures and equipment remaining in the facility for the level of cleaning required prior to their ultimate disposal.

In 1995, the Best Group, Inc. was hired by GM to complete the environmental deactivation and demolition of Building 9, and The Traverse Group was retained to oversee these activities. Results of the various closure activities are summarized and provided in this section.

2.2.1 - Wooden/Composite Floor Blocks

Wooden and resin composite floor blocks were located along the walkways throughout the Property. During the 1993 Property inspection the integrity of the floor blocks appeared sound. Because the wooden floor blocks cover concrete, the integrity of the floor beneath the blocks was addressed during the facility deactivation process when the blocks were removed and disposed. Wooden block flooring was determined to be non-hazardous, therefore; the wood block floors were removed and disposed of at the USPCI Echo Mountain Facility.

2.2.2 Asbestos

Asbestos was identified in the following:

- Tar paper wrap used to cover elbows;
- Pipe installation in the northwest corner of the building where the lines feeding Building 38 branch off the lines feeding Building 9;
- Thermal system insulation in scattered locations throughout the plant; and
- Roof membrane on both the new and old sections of the plant.

Nonfriable asbestos-containing material (ACM) was removed and disposed of at Venice Park. Friable ACM was disposed of at the USPCI Echo Mountain Facility. Because the building has been demolished and all debris has been removed, ACM is not an issue and this does not meet the definition of a PAOC.

2.2.3 Lead Paint

Lead abatement was completed on paint on Building 9 columns. The work was completed by MPC Environmental, a subcontractor to The Best Group on February 21, 1997. Because the building has been demolished and all debris has been removed, lead paint is not an issue at this Property and this does not meet the definition of a PAOC.

2.2.4 Polychlorinated Biphenyls

2.2.4.1 Transformers

Transformers containing PCB oil were drained and cleaned by S.D. Myers, a subcontractor to The Best Group. Both oil and the drained transformers have been removed from the site. PCB oil went to CWM Chem Services, while transformers formerly containing PCB oil were disposed by S.D. Myers. This work was completed on December 10, 1996.

2.2.4.2 Capacitors

PCB-containing capacitors had formerly been used in the Plant. Under a facility-wide program, GM gradually replaced them with non-PCB capacitors as equipment needed repair or as finances were allotted to replace them. The last PCB-containing capacitors were removed from Building 9 prior to 1995. The PCBs were drained and incinerated, and the capacitors were shipped for disposal by Aptus in Coffeysville, Kansas. No PCB-containing capacitors were found in Building 9 during facility deactivation.

2.2.5 Hazardous and Universal Waste

Universal waste included fluorescent light tubes that were disposed by Greenlites Recycling.

Wastes were accumulated in designated areas during deactivation and the containers were clearly marked with proper identification. Full containers were transported to the north dock storage area for shipment offsite, or to the "17 yard" storage shed. (See Part B - Section 1.9 for description.) Any unused product encountered during facility deactivation was either managed in the same manner or sent back to the supplier. Waste stream profiles were established for the wastes and removal was scheduled. All waste accumulation areas were reported to have been managed in accordance with 40 CFR 262.34. The only hazardous wastes generated during deactivation were PCB transformer oil, reported to be disposed at CWM Chem Services, and transformers that formerly contained PCB

oil were reported to be disposed at S.D. Myers.

2.2.5.1 Disposal of Drums

During deactivation, wastes were accumulated in designated areas within the plant and the containers were clearly marked with proper identification. Full containers were transported to the north dock storage area for shipment offsite, or to the "17 yard" storage shed. (See Part B - Section 1.9 for description.) Any unused product encountered during facility deactivation was either managed in the same manner or sent back to the supplier. Waste stream profiles were established for the wastes and removal was scheduled. All waste accumulation areas were reported to have been managed in accordance with 40 CFR 262.34.

2.2.5.2 Waste Storage Area

The North Dock Area was used to temporarily store waste when the facility was operating. The area was cleaned as discussed in Part B - Section 2.2.6.

2.2.6 Pits, Sumps and Trenches

Pits, trenches and sumps were cleaned during deactivation by high pressure wash with an aqueous degreasing agent. Sampling was performed in several of the pits, trenches, and sumps that contained oil prior to cleaning. The oil was then removed, and the units were cleaned as described. Wash waters were collected and transferred to the IWWPTP.

2.2.7 Hydraulic Equipment

All machinery remaining within the buildings was inspected for PCB containing capacitors and mercury switches. Any oil within the machines was sampled and analyzed for PCBs. PCBs were not detected in any machinery at Building 9.

2.2.7.1 Elevators

There were no hydraulic elevators at Building 9.

2.2.7.2 Hoists and Lifts

There were no hydraulic hoists or lifts at Building 9.

2.2.8 Floors and Interior Surfaces

Oily floors were high pressure washed using an aqueous degreasing agent. Wash and rinse waters were transferred to the IWWPTP. Wooden/composite floor blocks are discussed in Part B - Section 2.2.1.

2.2.9 Chlorofluorocarbon - Containing Equipment

Chlorofluorocarbon (CFC)-containing equipment present at the Building 9, such as air conditioners, drinking fountains, and water coolers, were located and removed during the deactivation activities by subcontractors to The Best Group. CFCs were salvaged by removing the material from the unit for future reuse. CFCs are no longer present at the Property.

2.2.10 Cooling Towers

There were no cooling towers associated with the Property.

2.2.11 Batteries

All batteries encountered during the deactivation inspections were divided by battery type. Lead acid batteries were placed on pallets, wrapped, and removed by GM for reclamation. Nickel Cadmium batteries were placed in 55-gallon drums and shipped to Chemical Waste Management for reclamation or removed by GM environmental staff. Battery charging areas identified during the inspections were cleaned during facility deactivation with a high pressure wash with a liquid detergent. Wash water and rinsate were collected and properly disposed.

2.2.12 Sewer Systems

Oil, grease, solids, and debris (if present) were removed from accessible sanitary sewers, manholes, and catch basins and properly disposed. The units were then cleaned using pressure jet washing system and visually inspected to insure all residues had been removed.

2.2.13 Tank Systems**2.2.13.1 UST**

There were no USTs associated with Building 9.

2.2.13.2 AST

The ASTs, including the 3,000 gallon fire hazard quench oil dump tank, were drained of oil and high pressure washed. The tanks were scrapped along with other steel from the facility during demolition activities by a metal recycling facility.

2.2.14 Fire Protection Trench Excavation

On November 26, 1996, during trench excavation activities for a fire protection system in Building 9, an oil-like substance was observed seeping into the trench in the vicinity of Column B-9, which is shown in Figure B-3. This event was reported to BBL by Best Group personnel conducting facility deactivation activities. This visual evidence of an oil-like substance seeping into the excavated trench indicates that this area meets the definition of a PAOC, and is discussed further in Part B - Section 4.

2.3 General Areas**2.3.1 Floors**

Part B - Section 2.2.1 discussed the wood block floor at the building. Other floors were typical of industrial buildings; concrete, with wear indication and light staining that was removed during facility decontamination.

2.3.2 Exterior Surfaces

2.3.2.1 Northwest Side of Building Gravel Area

The stairs leading down to the gravel area were heavily stained with oils and rain water puddles on the stairs exhibited a petroleum sheen. Another set of stairs leading from the power room also exhibited oil staining. Interviews with Property personnel indicated that the oil was probably dragged out by employee traffic. BBL observed oil surface staining throughout the area. It was noted that the sumps located in the exhaust forge presses area had overflowed in the past. In June 1996, on-site interviews indicated that GM personnel had excavated the top 6 to 12 inches of stained gravel. This gravel was disposed by USPCI. Paperwork or manifests could not be located.

Due to the heavy petroleum staining and sheen on the stairs, BBL considers the area with the pervious surface to meet the definition of a PAOC.

2.3.3 Railroad Tracks and Spurs

Railroad tracks are present on the north-northwest side of the Property. The tracks are used exclusively for transporting manufacturing material to and from the site. Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.3.3.1 Oil Staining

Minor oil staining typical of industrial railroad track yards was observed on the surface of rocks in the rock bed. Since there were no observed or documented releases at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

2.3.3.2 Railroad Ties

Railroad ties used to support track were typical creosote-treated lumber. Since the railroad tracks are on the north side of the Property fence, they run through and are used for the entire Flint West site, and they are downgradient from the Property, environmental impacts from the ties to the Property are not anticipated. Because there is no known or documented release at levels that would pose an unacceptable risk to human health and the environment, this area does not meet the definition of a PAOC.

3. Record Review

3.1 ERIIS Database Review

BBL retained Environmental Risk Information and Imaging Services (ERIIS) to perform an environmental records database search of federal, state, and county records in accordance with ASTM Standard Practice E 1527-94. The review of federal and state records identified five sites within a one-mile radius of the subject Property that may have been impacted by hazardous materials or petroleum products, or that store, use, or manufacture such materials as follows (some properties appear on multiple lists):

Database (miles)	Radius of Search (miles)	Properties Within Radius			Total Listings
		0 to 1/4 Mile	1/4 to 1/2 Mile	1/2 to 1 Mile	
National Priorities List (NPL)	1	0	0	0	0
RCRA Information System (RCRIS-TS) Facilities	1	0	0	0	0
No Further Remedial Action Planned Properties (NFRAP)	0.5	0	1	NA	1
CERCLA Information System (CERCLIS)	0.5	0	0	NA	0
RCRIS Large Quantity Generators (RCRIS-LG)	0.25	1	NA	NA	1
RCRIS Small Quantity Generators (RCRIS-SG)	0.25	1	NA	NA	1
Emergency Response Notification System (ERNS)	0.5	0	NA	NA	0
Michigan Environmental Contamination List (HWS)	1	0	1	1	2
Michigan Leaking Underground Storage Tank List (LRST)	0.5	0	5	NA	5
Michigan Solid Waste Facilities (SWF)	0.5	0	0	NA	0
Michigan Facility and Tank Data Report (RST)	0.25	1	NA	NA	1
NA = not within search radius					Total Listings
					11 ¹

¹ - These eleven listings represent only eight distinct properties.

The Flint West facility was identified in the Large Quantity Generators report, Michigan Environmental Contamination List, Michigan Leaking Underground Storage tank Report, and the Michigan Facility and Tank Data Report (Registered Storage Tank) database. The following sub-sections are a brief summary of the information provided in the above table. Based on a review of the ERIIS report and available Federal, State, and Facility records, none of the properties identified above have conditions that would constitute a PAOC at the Property.

3.1.1 Summary of United States Environmental Protection Agency Databases

National Priorities List

The National Priorities List (NPL) is a listing of facilities and/or locations where environmental contamination has been confirmed. The NPL was devised as a method for the EPA to prioritize these properties for the purpose of taking remedial action as funded by the Hazardous Waste Substances Superfund program, that was initially established under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and reinstated under the Superfund Amendments and Reauthorization Act of 1986 (SARA). No NPL properties were listed within a one-mile radius of the Property, nor is the Property listed.

Resource Conservation and Recovery Information System Treatment, Storage, and Disposal

The Resource Conservation and Recovery Information System Treatment Storage, and Disposal (RCRIS-TS) list identifies those facilities or locations that have notified the EPA of their activities relative to the handling of hazardous waste, as well as treatment, storage, and disposal facilities. The appearance of a property on this list does not necessarily indicate environmental problems on the property, but rather that the property is (or was) engaged in hazardous waste handling activities and, therefore, may have the potential to cause environmental degradation if hazardous wastes have been mishandled or otherwise released in an uncontrolled manner. Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS, March 3, 1995) is included in the RCRIS-TS report.

No RCRIS-TS properties were listed within a one-mile radius of the Property, nor is the Property listed.

No Further Remedial Action Planned Properties

The No Further Remedial Action Planned (NFRAP) Report contains information pertaining to properties which have been removed from the Federal EPA's CERCLIS Database. NFRAP properties may be properties where, following an initial investigation, no contamination was found, contamination was removed quickly without need for the property to be placed on the NPL, or the contamination was not serious enough to require federal superfund action or NPL consideration.

Flint West was listed on the NFRAP database. According to the database review, a preliminary site assessment was conducted on April 12, 1991. This site does not constitute a PAOC at the Property.

No other NFRAP sites were listed in the database review within a one-half-mile radius of the Property.

Comprehensive Environmental Response, Compensation and Liability Information System List

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list contains facilities and/or locations that the USEPA or state environmental agency is investigating to determine if an existing or threatened release of hazardous substances is present. These properties may also occur on the NPL list as slated for EPA-funded response action, or they may be under state or federal enforcement action for cleanup by the responsible parties.

No CERCLIS properties were listed within a one-half-mile radius of the Property, nor is the property listed.

Resource Conservation and Recovery Information System - Large Quantity Generators

The Resources Conservation and Recovery Information System - Large Quantity Generators (RCRIS-LG) report contains information pertaining to facilities that generate more than 1,000 kilograms (kg) of hazardous waste per month or meet other applicable requirements of the RCRA. Information pertaining to the status of facilities tracked by the RAATS (March 3, 1995) is included in the RCRIS-LG report.

Flint West (the Facility) was reported as a RCRIS-LG facility within a one-quarter-mile radius of the Property. Flint West continues to operate as a hazardous waste generator. Appearance of the facility on this list does not constitute a PAOC for the Property.

Resource Conservation and Recovery Information System - Small Quantity Generators

The Resource Conservation and Recovery Information System - Small Quantity Generators (RCRIS-SG) report contains information pertaining to facilities that either generate between 100 kg and 1,000 kg of hazardous waste per month or meet other applicable requirements of the RCRA. Information pertaining to the status of facilities tracked by the RAATS (March, 3, 1995) is included in the RCRIS-SG report.

The Cadillac Flint Tool and Die site located at 425 Stevenson Street located approximately 0.2 miles northwest of the Property was listed as a RCRIS-SG facility. This site generated the following hazardous wastes: D001, F002, F003, and F004 type wastes. These waste codes are described in detail in the *EPA Hazardous Waste Reference Guide* included in the ERIIS report. Management of hazardous waste alone at a nearby property does not constitute a PAOC at the Property and no other records reviewed indicated that this site would be a PAOC at the Building 9 property.

No other RCRIS-SG properties were reported within a one-quarter-mile radius of the Property, nor is the Property listed.

Emergency Response Notification System

The Emergency Response Notification System (ERNS) is a national computer database that is used to store information concerning the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The ERNS reporting system contains preliminary information on specific releases, including the spill location, the substance released, and the responsible party. The information in the ERNS pertains only to those releases that occurred between January 1, 1996, and August 22, 1996.

No ERNS locations were identified at the Property.

3.1.2 Summary of Michigan Department of Environmental Quality Databases**Michigan Environmental Contamination List (Act 307)**

The Michigan Environmental Contamination List (HWS) contains summary information pertaining to properties deemed hazardous by the MDEQ. Established under Michigan Environmental Response Act 307, the environmental contamination list is equivalent to the state hazardous waste properties list referenced in ASTM E 1527.94.

Flint West was listed on the HWS list. The ERIIS report stated that benzene, toluene, ethylene, and xylene (BTEX) constituents were released from petroleum bulk storage areas. These areas are discussed in the following section as the five leaking USTs identified in the Michigan Leaking Underground Storage Tank List section. These facilities do not constitute a PAOC at the Property, because groundwater flow from this area would not be expected to reach the Property.

The Oil Chem, Inc. Facility located at 711 12th Street located approximately 0.95 miles southeast of the Property is also on the HWS list. The ERIIS report stated that BTEX constituents were released from petroleum bulk storage areas. This site does not constitute a PAOC at the Property, because groundwater flow from this area would not be expected to reach the Property.

No other HWS properties were reported within a one-mile radius of the Property.

Michigan Leaking Underground Storage Tank List

The Michigan Leaking Underground Storage Tank (LRST) Report is a comprehensive list of all reported leaking above ground and underground storage tanks located within the State of Michigan. ERIIS' Leaking Underground Storage Tank (LUST) report consists of the listings maintained by the MDEQ LUST Section and the Michigan Department of State Police (Fire Marshal Division).

Five LRST sites were located within a one-half-mile radius of the Property. The properties listed are: Container Specialities, Inc located at 607 W. 2nd Street, approximately 0.3 miles northwest of the Property; Total Petroleum #2606 located at 1330 W. Court Street, approximately 0.35 miles southeast of the Property; Rupp's Marathon Service located at 527 N. Grand Traverse Street, approximately 0.48 miles northeast of the Property; 1031GK located at 502 W. 3rd Avenue, approximately 0.49 miles northeast of the Property, and Flint West. Based on their geographic relationship to the Property, and the hydrogeologic nature of the subsurface, these sites do not constitute PAOCs at the Property.

No other LRST properties were listed within a one-half-mile radius of the Property, nor at the Property.

Michigan Solid Waste Facilities List

The Michigan Solid Waste Facilities (SWF) List is a comprehensive listing of all active and inactive solid waste landfills and processing facilities within the State of Michigan.

No SWF properties were identified within a one-half-mile radius of the Property, nor at the property.

Michigan Facility and Tank Data Report

The Michigan Facility and Tank Data Report (RST) is a comprehensive listing of all registered underground storage tanks within the State of Michigan.

Dover & Company located at 651 Hall Street, approximately 0.24 miles southeast of the Property were listed on the RST. According to ERIIS, this site had one 1,000-gallon steel UST that has been removed. This site does not constitute a PAOC at the Property, because there are no documented release from the former UST, and its proximity with respect to groundwater transport would not be expected to move onto the Property.

No other UST property was identified within a one-quarter-mile radius of the Property.

3.1.3 Unplottable Sites

In addition to the above listed properties, the ERIIS database search also identified 7 "unplottable sites". Due to the limitations of the ERIIS database search, the locations of these properties could not be accurately determined. BBL personnel reviewed the street addresses and determined that none of these "unplottable sites" are located within one mile of the Facility. Therefore, it is unlikely that these properties have conditions that would constitute a PAOC at the Property.

3.2 Sanborn Fire Insurance Maps

The ERIIS collection of historical Sanborn Fire Insurance Maps was researched. Sanborn Fire Insurance Maps for the Property were reviewed for the following years: 1886, 1892, 1898, 1902, 1909, 1914, 1916, 1920, 1928, 1950, and 1970.

The Sanborn map for 1886 indicates that the Property was vacant. The Flint Wagon Works was located adjacent to the Property. The Sanborn map for 1892 indicates that the J.L. Wilcox Fruit Evaporator & Jelly Works was located on the approximate location of the Property. The F.R. Lewis Straw Board Factory, which operated as a paper mill, was located to the south of the Property across the Flint River. The Sanborn map for 1898 was similar to the 1892 map, there were no noticeable changes to the Property or its surroundings. The maps supplied from ERIIS for 1902 to 1914 do not show the Property location. The 1916 Sanborn map shows a building for the Library of Congress Map Division located on the land that would become the Property. The 1920 Sanborn map shows no noticeable changes when compared to the 1916 map. The 1928 Sanborn show the location of the Property with what appears to be plots of land designated as single-family homes and is referred to as the "McFahlans Addition to West Flint."

The 1950 Sanborn map shows the Property for the first time. Building 9 is shown as a single building constructed of steel frame with a concrete floor covered with wooden block. The Property is shown on the map as Factory Building Plant No. 9. A smaller building labeled for office personnel, is also present on the Property and is located just west of the main plant building.

Sanborn Maps from 1970 show no major changes at the Property. In general, the Sanborn Maps indicate that properties to the immediate south and east of the Property have been developed industrially by the General Motors Corporation since the 1920s. In addition, these maps indicate that the Property and surrounding properties have been used for industrial and commercial activities since the 1890s. Sanborn Maps reviewed indicate that residential property development has occurred north of 3rd Avenue and south of the Grand Trunk Railroad. The review of Sanborn Maps did not reveal any previous structures or processes that constitute a PAOC at the Property at the present time.

3.3 Freedom of Information Act Review

3.3.1 MDEQ Files

BBL personnel visited the MDEQ to review files available under the Michigan Freedom of Information Act, P.A. 442 of 1976.

3.3.1.1 Underground Storage Tank Division

A review of USTD files did not reveal any PAOCs at the Property beyond areas discussed in this report.

3.3.1.2 Environmental Response Division

A review of ERD files did not reveal any PAOCs at the Property beyond areas discussed in this report.

3.3.1.3 Waste Management Division

A review of WMD files did not reveal any PAOCs at the Property beyond areas discussed in this report.

3.3.1.4 Surface Water Division

Files were reviewed from the SWD. This review did not reveal any PAOCs at the Property beyond areas discussed in this report.

3.3.2 Fire Marshall UST Files

Files were reviewed from the Fire Marshall UST. This review did not reveal any PAOCs at the Property beyond areas discussed in this report.

3.4 Title Search

Because of the quantity of historical files and information available concerning previous operations at the Property and Facility, a title search was not performed for this Environmental Site Assessment.

3.5 Site Environmental Files

GM site environmental files were reviewed to identify any information that would indicate a release at levels that would pose an unacceptable risk to human health or the environment. This section is organized based on files. The file review was conducted during the initial visit to the site on June 19 and 20, 1996.

3.5.1 Spill Reports

Spill reports found during review of facility files included accounts of a chromic acid spill in 1990, a spill of TCE from the degreasing unit, releases of oily material to the storm water system which discharges to the Flint River, and overflow of grinding oil onto Stevenson St. and the ground along the railroad tracks. Synopses of the reports are as follows:

On June 12, 1990, a gondola containing chromic acid waste (sludge, pipes, rags, etc.) leaked during transport from Plant 9. The door seal failed and approximately 1 gallon of chromic acid spilled onto the pavement and into a storm sewer catch basin. The catch basin, which contained approximately 10 gallons of rainwater, was pumped out by MPC Environmental, and basin and pavement were rinsed with a sodium metabisulfite solution. A water sample collected from the storm sewer immediately down gradient of the catch basin was analyzed using a HACH Chromsaver 3 Cr+6 test kit and found to contain 0.3 parts per million hexavalent chromium, indicating that some quantity of acid-impacted water did overflow the basin. Water samples were collected on June 13, 1990 from the catch basin, down-gradient manhole, and Outfall #22 for on-site analysis with the HACH test kit and for laboratory analysis. Concentrations of hexavalent chromium were below detection limits in all samples (0.05 mg/L for lab samples, below detection limits (BDL) samples from HACH kit reported as "0.0 ppm).

On June 7, 1991, a valve left open during a solvent change in the Degreaser in Bay E-5 allowed discharge of TCE to the industrial wastewater system.

On March 12, 1991, pumps diverting storm water runoff from the roof of Building 9 and some process water from an unidentified source within the plant failed, allowing discharge to the storm water sewer system. The pumps had been repaired by the time river patrol arrived. Outfall #22 was inspected and there was no visible evidence of a release.

On August 19, 1991, a pollution overflow system within Plant 9 caused a discharge of oily material to the City of Flint storm sewer because the flow exceeded pump capacity. A sheen approximately 20 feet wide extended about a half mile down the river. The sheen was contained with booms and there was no visible damage to the river bank or local aquatic life. The report states that the "connection between Plant 9 and Flint river was plugged on 8/23/91;" a handwritten note on the report states that the plug was removed 8/26/91. Accordingly, this must be the sump located on the northeastern portion of the Property.

On May 14, 1993, the motor became uncoupled from the pump in the sump pit under the north yard awning. Therefore, grinding oil was no longer being pumped out of the sump pit into the industrial waste lines. The oil level rose until it backed up the trench drain at the Stevenson St. entrance and overflowed into the street. Approximately 50 to 100 gallons of oil ran down Stevenson St. to the railroad tracks, then west along tracks (approx 75-100 feet) following natural drainage paths to the south and west. Sand and oil absorbing material were used to clean up the street and soak up oil on the ground. The top 2 to 3 inches of dirt were also removed. City of Flint's Fire Department was present and approved the cleanup.

Based on review of the above information and inspections conducted, these spills do not constitute PAOCs at the site.

3.5.2 Previous Investigations and Remedial Action

Files documenting previous investigations and remedial action were reviewed. Reports of tank closures and related investigations from Plants 7 and 4, which are immediately adjacent to Building 9, were discovered during a review of facility files. There were no reports of previous investigations at Building 9, and information reviewed on investigations conducted at Plants 7 and 4 does not constitute PAOCs at Building 9.

3.5.3 Maintenance Files

Maintenance files were reviewed. No information suggesting that a release to the environment of oil or hazardous substances had occurred was discovered during a review of the maintenance files for Plant 9.

3.5.4 Plant Drawings Files

The plant drawings files were reviewed. Although this file did not contain information concerning releases, it did provide information on location of utilities, process lines, and areas of interest.

3.5.5 Waste Management Files

3.5.5.1 Hazardous Waste Manifests

Hazardous waste manifests files were reviewed. This provided information on types and quantities of hazardous waste generated at the facility and transported off site. It also provided information about the point of generation which helped identify areas for BBL to investigate. Hazardous waste generated by the facility included TCE degreasing sludge, plating sludge, PCBs drained from capacitors as they were replaced, small volumes of paint-related waste, and hazardous roofing tar. Information learned from this review is incorporated into what is addressed in Part B - Section 2.

3.5.5.2 Non-hazardous Solid Waste

The non-hazardous solid waste file was reviewed to identify information on the quantities and types of non-hazardous solid waste generated at the Property. Non-hazardous wastes generated at Building 9 included Dubro grease, grinding swarf, shop blast dust, waste oil, and wooden floor blocks, as they were replaced. Similar to the hazardous waste manifests file, this information assisted BBL in review of the various areas at the Property in an effort to identify PAOCs. Information learned from this review is incorporated into what is addressed in Part B - Section 2.

3.5.6 Material Usage

The material usage file contained information concerning product in material usage at the facility. This file review assisted BBL in determination of the types and quantities of materials used at the facility which assisted with review of specific areas. Information learned from this review is incorporated into what is addressed in Part B - Section 2. Materials used at Building 9 consisted primarily of 21 2N Chrome Alloy and High Carbon Steel. Other materials used included TCE, Dubro grease, quench oil, water-based grinding solution, plating solution, shop blast dust, small quantities of paints and solvents, and roofing tar, which was used for maintenance purposes.

4. Conclusions and Recommendations Based on Environmental Site Assessment

Five areas encountered during the Phase I ESA met the definition of a PAOC and require further investigation. BBL recommended that a Phase II Environmental Site Investigation (ESI) be conducted to confirm or deny the presence of contaminants in these areas at levels that could pose an unacceptable risk to human health or the environment.

PAOC 1 - Electrical Substation

Minor amounts of oil were observed seeping into southern sidewall cracks in the electrical substation during the October 1995 Property walk through conducted by BBL. The oil was not from the PCB transformers, which appeared to be in good condition. During the June 1996 Property walk through, the cracks in the south wall were plugged with silicone caulk. It is thought that the seepage is from grinding/welding area oil rather than oil from the transformers. This area should be further investigated to determine if contaminants are present in soil and groundwater at concentrations that could pose an unacceptable risk to human health and the environment.

PAOC 2 - Stormwater Pump and Sump Located in the North Storage Area

Releases of oils were observed during the October 1995 Property walk through and historically have been documented from the overflow of the north storage yard stormwater and wastewater collection system. The overflow of these substances was documented as flowing 75 to 100 feet east down the adjacent railroad tracks. In addition, personnel interviews conducted during the June 1996 Property visit indicated releases of oil and oily wastewater, the most recent of which occurred on May 26, 1996. This area will require further investigation to determine if contaminants are present in soil and/or groundwater at concentrations that could pose an unacceptable risk to human health and the environment.

PAOC 3 - Northwest Side of Building Gravel Area

During the October 1993 Property walk through, oil staining was observed on the gravel area along the northwest side of the Property. During the June 1996 Property visit, GM personnel indicated that this area was excavated to a depth of 6 to 12 inches, and the excavated material was disposed by USPCI. Further investigation is required to determine if contaminants are present in soils and groundwater at concentrations that pose an unacceptable risk to human health and the environment.

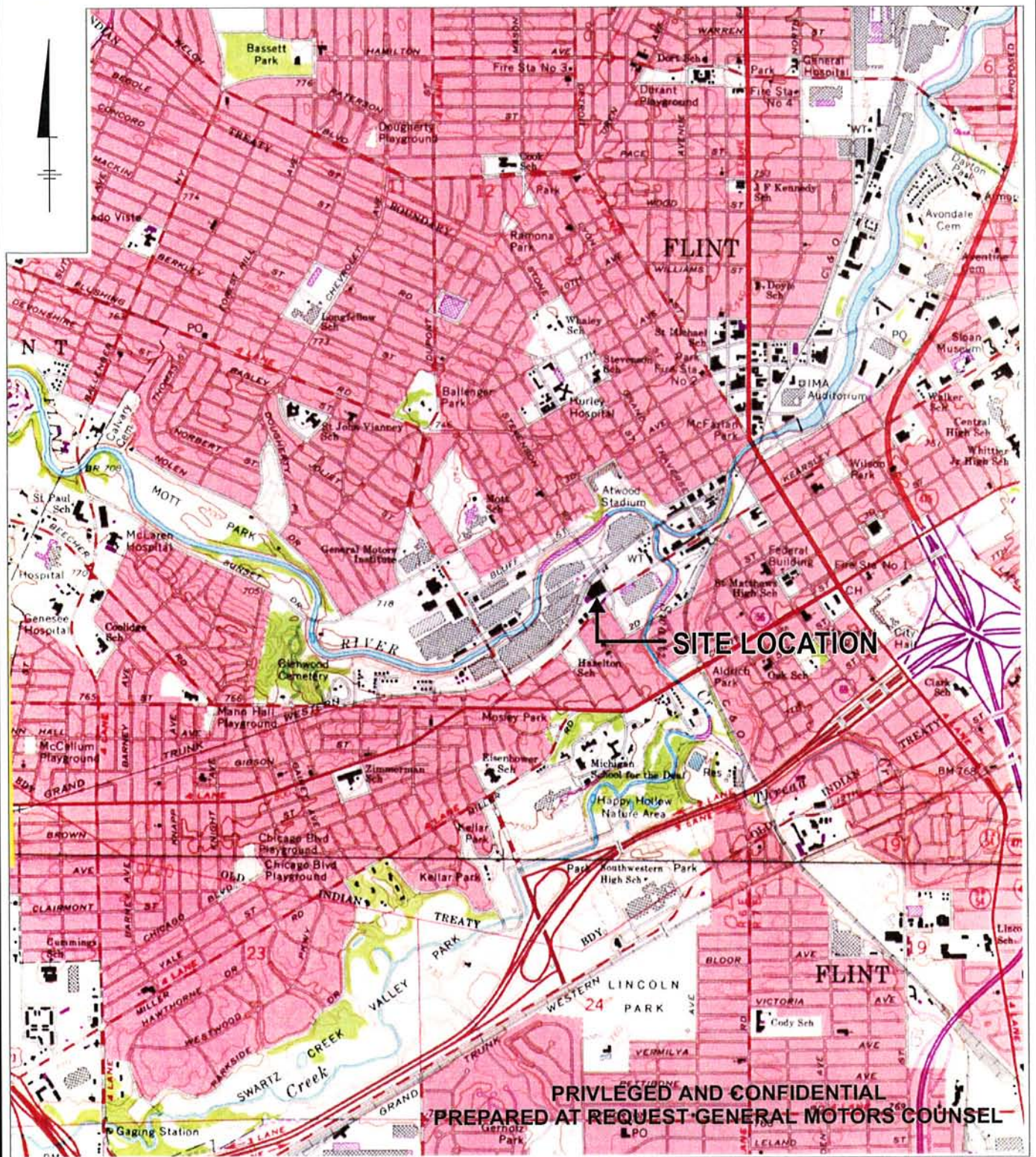
PAOC 4 - Fire Protection Trench Excavation

On November 26, 1996, during trench excavation activities for a fire protection system in Building 9, an oil-like substance was observed seeping into the trench in the vicinity of Column B-9. This event was reported to BBL by personnel conducting the facility deactivation. This visual evidence of an oil-like substance seeping into the excavated trench indicates that this area meets the definition of a PAOC, and should be investigated further.

PAOC 5 - Former Trichloroethylene Degreasing Unit and Sump

In a report documenting an UST removal and petroleum contaminated soils removal operation, low levels of TCE were reported in the groundwater 150 feet downgradient from Building 9. The source of the TCE is unknown, but it may be the former trichloroethylene degreasing unit and sump. Due to the TCE groundwater impacts 150 feet downgradient from known TCE operations and a documented release, BBL considers this area and the groundwater to the north PAOC. Further investigation is required.

PART B - FIGURES



MAP SOURCE: UNITED STATES GEOLOGIC SURVEY
TOPOGRAPHIC QUADRANGLE, 7.5 MIN.
SERIES, FLINT NORTH & FLINT SOUTH,
MICHIGAN, (1969).

2000 0 2000
APPROXIMATE SCALE IN FEET



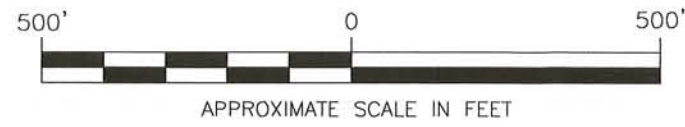
GENERAL MOTORS CORPORATION
BUILDING 9, DELPHI - FLINT WEST FACILITY
FLINT, MICHIGAN
BASELINE ENVIRONMENTAL SITE ASSESSMENT

SITE LOCATION MAP

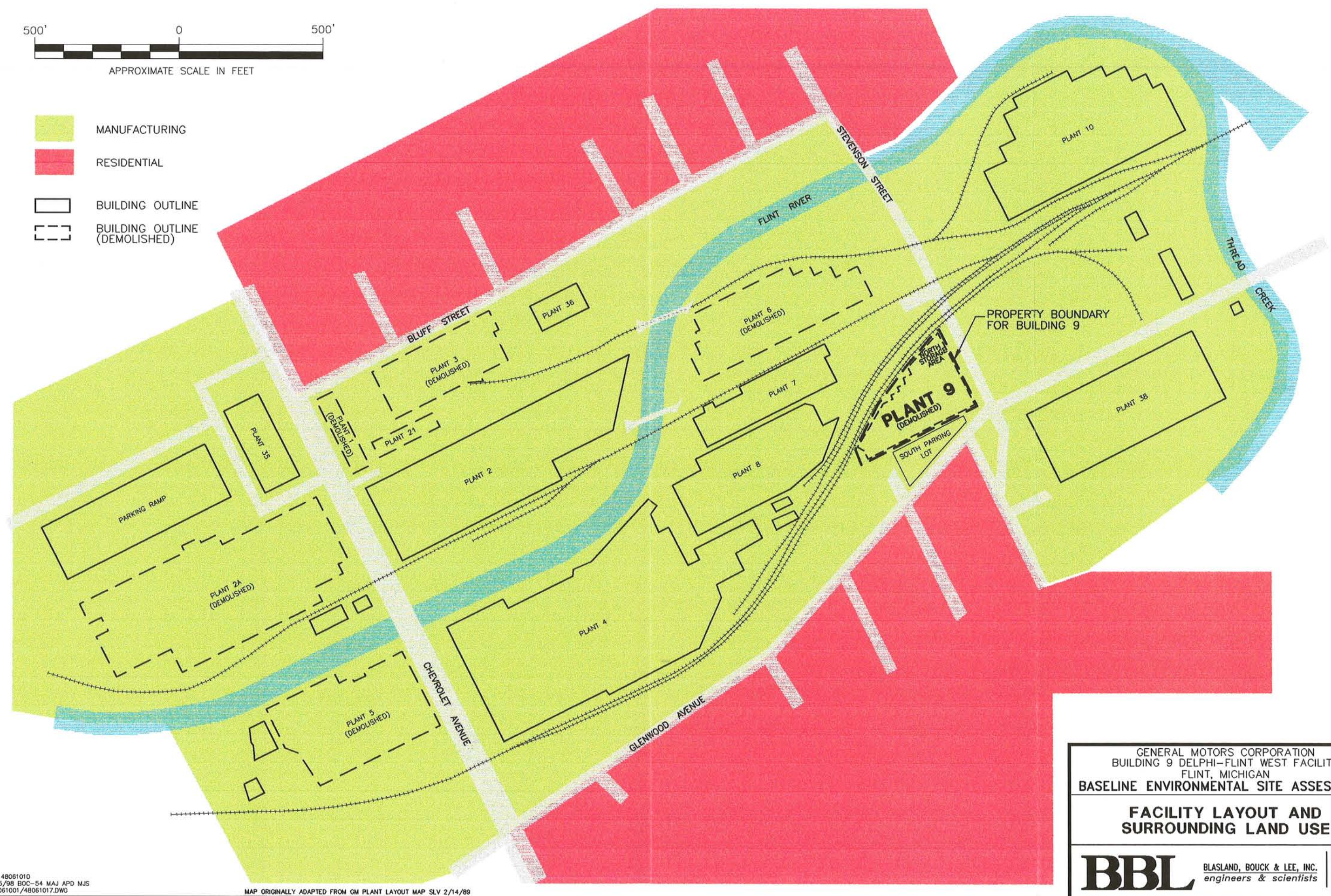
BBL

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engineers & scientists

FIGURE
B-1



- MANUFACTURING
- RESIDENTIAL
- BUILDING OUTLINE
- BUILDING OUTLINE (DEMOLISHED)



GENERAL MOTORS CORPORATION
BUILDING 9 DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN
BASELINE ENVIRONMENTAL SITE ASSESSMENT

**FACILITY LAYOUT AND
SURROUNDING LAND USE**

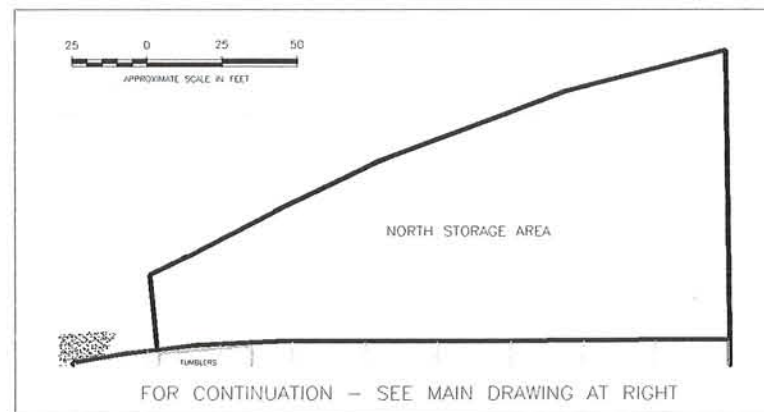
BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
B-2

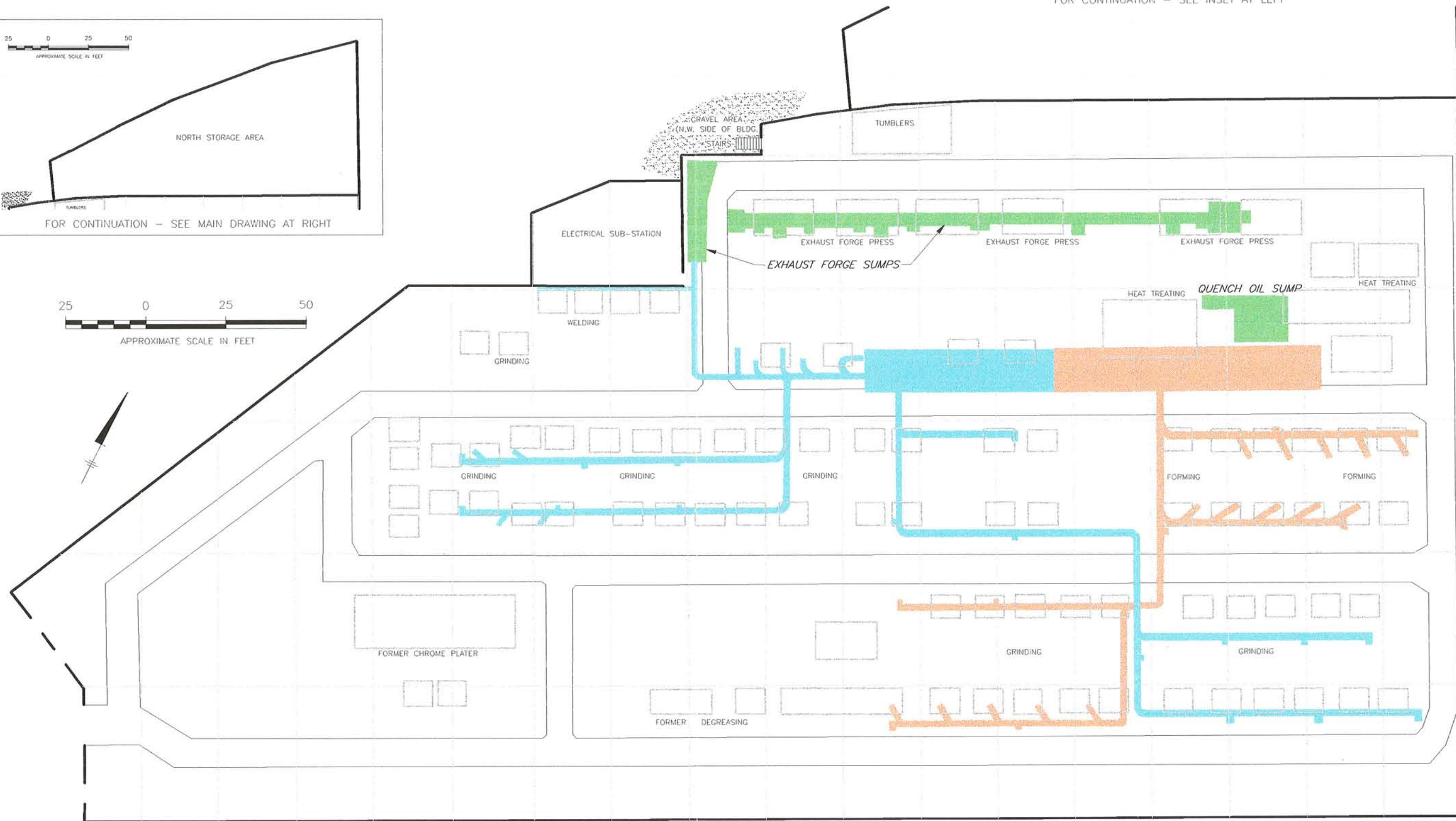
P: 48061010
3/5/98 BOC-54 MAJ APD MJS
48061001/48061017.DWG

MAP ORIGINALLY ADAPTED FROM GM PLANT LAYOUT MAP SLV 2/14/89

FOR CONTINUATION - SEE INSET AT LEFT



25 0 25 50
APPROXIMATE SCALE IN FEET



LEGEND



CUTTING FLUIDS TREATMENT AND RECYCLING

GRINDING OILS TREATMENT AND RECYCLING

FORGING SYSTEMS / SUMPS



PLANT PROCESS MACHINERY

P: 48076069
1/31/97 BOC-54 MAJ, APD
48076050/BASE-ESA/48076069.DWG

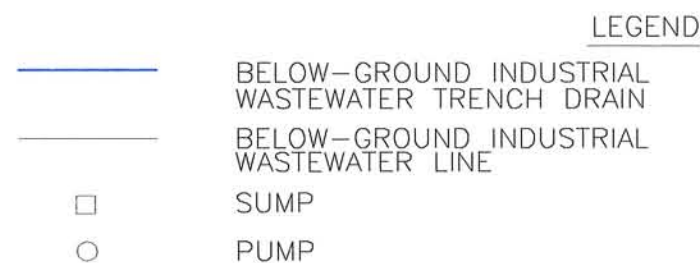
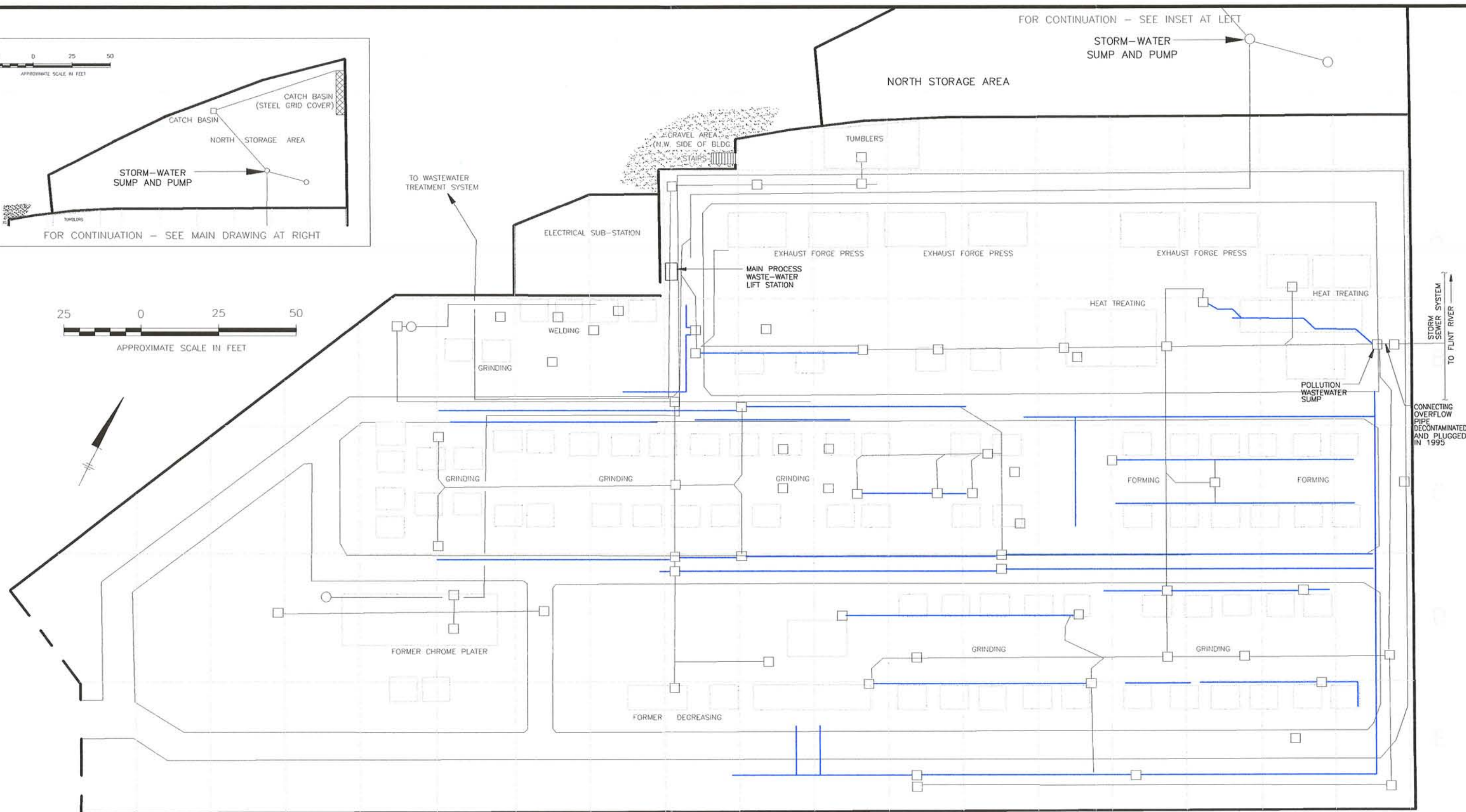
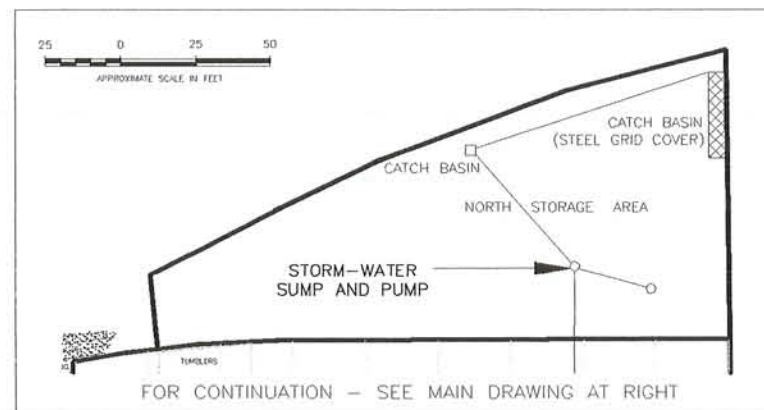
GENERAL MOTORS CORPORATION
BUILDING 9 DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN
BASELINE ENVIRONMENTAL SITE ASSESSMENT

TREATMENT, RECYCLING AND LUBRICATION SUMPS AND SYSTEMS

BBL

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FIGURE
B-4



□ PLANT PROCESS MACHINERY

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GENERAL MOTORS CORPORATION
 BUILDING 9 DELPHI-FLINT WEST FACILITY
 FLINT, MICHIGAN
 BASELINE ENVIRONMENTAL SITE ASSESSMENT

**WASTEWATER TREATMENT
 SYSTEMS LAYOUT**

BBL BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
B-5

PART B - TABLES

TABLE B-1
SURROUNDING BUILDING INFORMATION
BASELINE ENVIRONMENTAL SITE ASSESSMENT - BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

BUILDING #	BUILT	ORIGINAL HISTORICAL USE	SQ. FT.	PRESENT PRODUCTION OR USE	PROCESSES
1	1927	Main Office	59,390	No production, building has been demolished	Purchasing, finance, and administration
2	1916	Assembly Plant	500,000	Crankshafts, radiator grilles, instrument panels, gas tank reservoirs, headlamp bezels	Grinding, balancing, and drilling, plastic injection molding, vacuum metalizing, and painting
2A	1922	Fisher Body	485,000	Exhaust systems, radiator supports (deactivated October 1995 and demolished)	Metal stamping, tube mills, vector benders
4	1915	Mason motors	700,000	Engines	Complete engine assembly
5	1926	Valves, camshafts, cylinder cases	176,000	Cylinder cases, radiator caps (Demolished August 1995)	Complete machining of rough castings
11	1916	Powerhouse	64,000	No production	Steam/Compressed air for all plants and GMI
30	1949	IWWPTP	8,000	No production	Waste water treatment
37	1966	Primary electrical switch	3,000	No production, building to be demolished	Switch gear
42	1968	IWWPTP	3,700	No production	Waste water treatment
44	1971	Fuel oil pump	512	No production (Spill response equipment storage), scheduled to be demolished	None

Notes:
IWWPTP - Industrial Wastewater Pre-Treatment Plant
Information for this table provided by Facility personnel.

TABLE B-2
RELATION BETWEEN STRATIGRAPHIC AND HYDROGEOLOGIC UNITS IN THE MICHIGAN BASIN
BASELINE ENVIRONMENTAL SITE ASSESSMENT - BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

ERA	PERIOD	EPOCH	GLACIATION	STRATIGRAPHIC UNIT		HYDROGEOLOGIC UNIT
Cenozoic	Quaternary	Holocene				Glacial drift aquifer ¹
		Pleistocene	Wisconsin Illinoian Pre-Illinoian			
	Pennsylvanian	Middle		Grand River Formation		Grand River-Saginaw aquifer
		Early		Saginaw Formation		Saginaw confining unit
Paleozoic	Mississippian	Late		Grand Rapids Group	Bayport Limestone	Parma Sandstone Member
					Michigan Formation	Michigan confining unit
		Early		Marshall Sandstone	Stray Sandstone Member	Marshall aquifer
					Napoleon Sandstone Member	
				Coldwater Shale		Coldwater confining unit

Notes:

Dotted lines indicate unconformities
Table modified from Mandle and Westjohn 1989.

¹ Glacial drift deposits; Semi-confining in the Flint vicinity

**PART C - SUMMARY OF PHASE II ENVIRONMENTAL SITE
INVESTIGATION (BBL)**

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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1. Technical Approach

1.1 Purpose of the Investigation

Blasland, Bouck & Lee, Inc. performed a Phase II Environmental Site Investigation (ESI) at the former Building 9 Property (Property) Delphi - Flint West Facility (Flint West) located at 300 Chevrolet Avenue, Flint, Michigan (Figure B-1). The purpose of the ESI was to verify the presence or absence of subsurface contamination at levels that pose an unacceptable risk to human health and the environment at potential areas of environmental concern (PAOCs). The PAOCs were identified in the Phase I Environmental Site Assessment (ESA) (BBL, 1997). An initial field investigation was performed in March 1997. A supplemental field investigation was performed in October 1997 to further investigate PAOC 3, PAOC 4, and PAOC 5.

The purpose of the ESI was:

- 1) To determine whether hazardous substances or oil had been released to the environment at the PAOCs identified in the ESA; and
- 2) To determine the concentrations of hazardous substances in the subsurface and compare those levels to risk-based cleanup criteria described below.

A PAOC is defined as an area with a documented release of hazardous substances or petroleum products that could pose an unacceptable risk to human health or the environment. Risk-based cleanup criteria are exposure threshold values that pose a significant risk to human health or the environment as defined in amendments to Part 201 of the Natural Resources and Environmental Protection Act (NREPA), 1994 of Public Act (PA) 451 (Formerly Michigan Environmental Response Act [MERA], PA 307). These amendments are reflected in the generic industrial and commercial land use criteria listed in Operational Memorandum #14, Revision 2 (OM #14), and subsequent addenda to OM #14.

1.2 Scope of Work

The field investigation included installation of soil borings, temporary monitoring wells, permanent monitoring wells, soil screening and laboratory analysis to determine if potential soil and/or groundwater contamination is present at the Property.

The ESI focused on the following:

- The hazardous substances and oil known or likely to have been managed at the PAOCs identified in the ESA for the facility (BBL, 1996);
- The areas most likely to have been impacted by the suspected releases; and
- Reviewing and incorporating State of Michigan statutes, rules, and guidance to ensure that proper and acceptable analysis protocols were used.

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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1.3 Overview

The field investigation was performed in accordance with the sampling and analysis plan (SAP) and the site-specific Quality Assurance Project Plan (QAPP) developed for Flint West investigations. Soil borings, temporary monitoring wells, and permanent monitoring wells were placed in the areas most likely to have been sources or discharge points of contamination. Sample locations are shown on Figure C-1.

1.4 Hydraulic Probe Investigation

A hydraulic probe was used to obtain soil samples for field screening and laboratory analysis. Samples were collected continuously in 2-foot intervals from the surface to the water table (ranging from 12 to 20 feet), with an additional sample collected from the 0 to 6-inch interval. The soil samples were obtained using four-foot hollow stainless steel core barrels that were fitted with disposable acetate liners on the inside. A new liner was used for every four feet of soil sampled and core barrels were decontaminated between use. Field work entailed the following:

- Mobilized to site and coordinated site access and control.
- Determined soil boring locations and coordinated concrete coring operations.
- Calibrated the Toxic Vapor Analyzer 1000 (TVA-1000).
- Conducted health and safety meetings.
- Performed soil borings to the water table with a split spoon sampler.
- Described soils according to Burmister (1979) and using the Unified Soil Classification System (USCS).
- Screened soil samples at 2-foot intervals to the water table with a TVA-1000 to detect volatile organic compound constituents and to augment visual observations.
- Collected soil samples for laboratory analysis.
- Decontaminated equipment prior to, during, and after boring and sampling tasks at each boring/sampling point.
- Installed temporary well points, purged, and collected groundwater samples.
- Properly abandoned borings with bentonite and grout.

Soil boring logs are included in Appendix A of the Phase II Environmental Site Investigation Report for Building 9 (BBL, 1997).

1.5 Monitoring Well Installations

A hydraulic probe rig installed a total of three 1-inch diameter wells during the initial field investigation. One well was installed at PAOC 3, adjacent to the location of temporary monitoring well TW-P9-3-2. Two wells were installed to evaluate groundwater concentrations potentially sourced from PAOC 5. A down-gradient well was installed in the North Storage Area adjacent to the location of temporary monitoring well TW-P9-5-4. A source well was installed in the location of the former TCE degreasing units.

A conventional drilling rig installed a 2-inch diameter monitoring well at PAOC 4. A 2-inch diameter well was used at this PAOC to provide a larger area for free oil to migrate into the well. The well was installed using a truck-mounted drilling rig and hollow-stem augers. This monitoring well was constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) and consisted of 5 feet of 0.010-inch slot well screen and 15 feet of solid riser. This well design was based on the depth to the water table at the time of installation. The well design ensured that the well screen intersected the water table, allowing free oil to enter the well. A 6/12 silica sand pack was placed

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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around the well screen to two feet above the well screen. A 1-foot thick bentonite seal was placed above the silica sand pack. The remaining annular space was filled with a bentonite cement slurry.

The wells installed during this investigation have locking caps and flush-mount bolt-down protective covers embedded in concrete. Development of the wells was performed by overpumping until the water ran clear. However, due to low hydraulic conductivities, in several cases the wells were purged dry before the water was clear. The wells were developed prior to groundwater sample collection.

1.5.1 Soil Screening

Two glass jars from each interval were half filled with soil, covered with aluminum foil, and placed in the pump house to warm, allowing organic vapors to accumulate in the headspace. The headspace gas was subsequently sampled by inserting the TVA-1000 probe through the foil. One jar from each interval was sampled with a charcoal filter assembly attached to the probe (to determine the naturally occurring component) and one jar was sampled without a filter. The difference in measured organic vapor content between the two samples (net hydrocarbon vapor concentration) is attributed to non-naturally occurring sources.

1.5.2 Laboratory Sample Collection

Soil samples were selected for laboratory analysis based on visual observations and TVA screening, as described in Part C Section 1.5.1, with a minimum of two samples per boring. A soil sample from the 0-6-inch interval was routinely collected for laboratory analysis because potential impacts were generally believed to have been from the surface. As the boring progressed, additional soil samples were collected in laboratory jars when field screening indicated that deeper intervals were more highly impacted. If field screening data was not conclusive, a second sample was collected for laboratory analysis from the interval immediately above the water table.

The samples were placed on ice in coolers prior to shipping to Brighton Analytical Laboratories (Brighton). Soil samples were analyzed by the appropriate laboratory analytical methods described in Table C-1, taking into consideration target method limits listed in MDEQ Operational Memorandum #6, Revision 4 (OM #6).

1.5.3 Groundwater Investigation

During the initial field investigation, groundwater samples were collected by re-entering the soil boring with the hydraulic probe equipped with a well screen. The sleeve over the well screen was retracted and, prior to sample collection, the temporary well was developed with a peristaltic pump until the water ran clear.

Samples to be analyzed for metals were filtered in the field through a 1-micron (initial investigation) or 0.45-micron filter (supplemental investigation). A 0.45-micron filter was considered a reasonable choice for discriminating between suspended and dissolved particulate matter, as discussed in Part C Section 1.5.3.1. The pH of metals samples was checked in the field. If the pH was greater than 2, 10 percent nitric acid solution was added to adjust the pH accordingly.

The samples were placed on ice in coolers prior to shipping to the laboratory. Once the coolers were packed, they were sealed with packing tape and a custody seal was placed across the lid of the cooler. The purpose of the custody seal was to indicate whether tampering or substitution occurred en route to the laboratory.

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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Laboratory chain-of-custody (COC) forms were used to record the samples collected for each sampling event. The COC lists the sample collection location, the medium sampled, the date and time of sampling, and the parameters for analysis. The COC also records the personnel who have handled the samples from the point of origin to receipt at the laboratory.

1.5.3.1 Use of Field-Filter Samples in Determining Metals Concentrations in Groundwater

Historically, contaminant concentrations in groundwater venting to surface water from unfiltered samples must be compared to groundwater/surface water interface (GSI) criteria. However, monitoring wells that are completed in materials of low hydraulic conductivity or with a high clay content are difficult to develop properly. It is equally difficult to obtain a water sample that is free of sediment from these wells. When water flows within unconsolidated sediments, the majority of particulates settle out because of the tortuosity of the flow path around the intergranular porosity and gravitational effects. Although substantial research has documented that colloidal particles can travel notable distances in unconsolidated formations (Gschwend and Reynolds, 1987; Eicholtz et al, 1982; Enfield and Bengtson 1988), many researchers conclude that sediment produced from monitor wells in unconsolidated formations is due to sloughing of particulate material from the borehole under the turbulent flow conditions induced by well development and pumping, and only minimal colloidal matter in groundwater samples is from natural groundwater flow. In a Superfund Ground Water Issue Paper, Puls and Barcelona (1989) recommended using a 0.1-micron filter when collecting samples for estimates of the dissolved fraction; for estimates of contaminant mobility, filters with a pore size greater than or equal to 2 microns should be used. In practice, 0.45-micron filters are commonly used to balance between the objectives of isolating dissolved constituents and permitting reasonable use in the field. Hem (1989) concluded that there is good evidence that particulate metal hydroxides exist in most surface streams in the form of particulates smaller than 0.45 microns. Further, MDEQ toxicologist Chris Flaga stated that data from groundwater samples obtained using a low-flow pump should be comparable to that from groundwater samples field-filtered using a 0.45-micron filter.

GSI values established for metals since August 1997 are for dissolved concentrations of metals. Therefore, data from the field-filtered samples were compared to GSI criteria.

1.6 Quality Assurance/Quality Control

A site-specific QAPP was developed and integrated into the site-specific project plan to ensure that appropriate data collection and analysis procedures were implemented, resulting in data of an acceptable accuracy and precision. The QAPP identifies data quality objectives (DQO) appropriate for the data use and the field and laboratory data collection and analysis procedures required to generate data meeting the site-specific DQO.

Quality assurance/quality control (QA/QC) samples to determine the accuracy and precision of field sampling methods were collected and analyzed as follows:

- Two equipment rinse blanks for the ten Michigan metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, silver, selenium, and zinc), two for SVOCs, and one for VOCs. To achieve the target method detection limits specified in OM #6, EPA Method 200.8 was used to analyze for the metals except mercury, and EPA Methods 245.1, 8260, and 625 were used to analyze for mercury, VOCs, and SVOCs, respectively.
- One soil duplicate for the ten Michigan metals, three for SVOC, and one for VOC. To achieve target method detection limits specified in OM #6, EPA Method 6020 was used to analyze for all metals except mercury, and EPA Methods 7471, 8260, and 8270 were used to analyze for mercury, VOCs, and SVOCs, respectively.

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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- One trip blank for VOCs. To achieve target method detection limits specified in OM #6, EPA Method 8260 was used to analyze for VOCs.
- One equipment rinse blank for VOCs. To achieve the target method detection limits specified in OM #6, EPA Method 8260 was used.
- One duplicate for VOCs. To achieve target method detection limits specified in OM #6, EPA Method 8260 was used.

QA/QC procedures and reporting requirements for laboratory analyses are specified in the Flint West QAPP developed by BBL for projects at Flint West. Laboratory data validation procedures for this project were developed in accordance with BBL's Quality Assurance Plan for environmental data collection and analysis, and followed practices specified by the United States Environmental Protection Agency (USEPA) in "Laboratory Data Validation Functional Guidelines (USEPA, 1991)," "Contract Laboratory Program National Functional Guidelines for Organic Data Review," (USEPA, 1993), and "Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," (USEPA, 1994). The objectives of the data validation procedures were to review the laboratory data, note deviances from the procedures and limits defined in the QAPP, and discuss the effects of these deviances on the data reported.

1.7 Health and Safety Plan

A Health and Safety Plan (HASP) (BBL, 1995) was prepared to ensure that field personnel were adequately protected from injury due to physical hazards and exposure to hazardous substances above acceptable levels. The HASP was prepared in accordance with Title 29 of the Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). Personnel entering the Property as part of the ESI were required to read the HASP and sign the HASP sign-off sheet. Air monitoring was conducted to evaluate potential exposure levels in accordance with procedures described in the HASP.

1.8 Mobilization and Work Schedule

The BBL field team and Superior Environmental, the drilling subcontractor, mobilized to the Property on Monday, March 24, 1997, for the initial field investigation. Field work was completed on March 26, 1997. The supplemental field investigation began on Thursday, October 23, 1997, and was completed on October 24, 1997. Each day, prior to commencing work, a health and safety meeting was held, and the field instruments were calibrated in accordance with procedures described in the QAPP.

1.9 Field Investigation

The field investigation focused on the five PAOCs identified during the Environmental Site Assessment, as shown on Figure C-1 of this report.

1.9.1 PAOC 1 - The Electrical Substation

1.9.1.1 Field Screening

Two soil-boring locations (SB-P9-1-1 and SB-P9-1-2) were chosen to sample the subsurface south of the Electrical Substation. Samples were collected continuously in two-foot intervals to the water table and screened visually and with the TVA-1000, during the initial field investigation.

1.9.1.2 Laboratory Analysis Rationale

Four soil samples were collected from soil borings SB-P9-1-1, and SB-P9-1-2 for laboratory analysis based on screening results, during the initial field investigation. Soil samples were analyzed for SVOC by EPA Method 8270. One sample from SB-P9-1-1 was also analyzed for the 10 Michigan metals by EPA Method 6020 for all metals except mercury, which was analyzed using EPA Method 7471.

One groundwater sample was collected and analyzed for SVOC by EPA Method 625 from temporary monitoring well TW-P9-1-1, installed in the soil boring location of SB-P9-1-1, during the initial field investigation.

1.9.2 PAOC 2 - Stormwater Pump and Sump in North Storage Area

1.9.2.1 Field Screening

Three soil-boring locations (SB-P9-2-1 through SB-P9-2-3) were chosen to sample the soil beneath the Stormwater Pump and Sump in North Storage Area. Samples were collected continuously in two-foot intervals to the water table and screened visually and with the TVA-1000, during the initial field investigation.

1.9.2.2 Laboratory Analysis Rationale

Six soil samples were collected from soil borings SB-P9-2-1, SB-P9-2-2, and SB-P9-2-3 for laboratory analysis. The soil samples were analyzed for SVOC by EPA Method 8270, during the initial field investigation. One sample from SB-P9-2-3 was also analyzed for the 10 Michigan metals by EPA Method 6020 for the metals except mercury, which was analyzed using EPA Method 7471.

One groundwater sample was collected and analyzed for SVOC by EPA Method 625 from temporary monitoring well TW-P9-2-3, installed in the soil boring location of SB-P9-2-3.

1.9.3 PAOC 3 - Gravel Area, Northwest Side of Building

1.9.3.1 Field Screening

Two soil-boring locations (SB-P9-3-1 and SB-P9-3-2) were chosen to sample the soil beneath the gravel area on the northwest side of the building. Samples were collected continuously in two-foot intervals to the water table and screened visually and with the TVA-1000, during the initial field investigation. One permanent monitoring well was installed at this PAOC during the supplemental field investigation.

1.9.3.2 Laboratory Analysis Rationale

Four soil samples were collected from soil borings SB-P9-3-1 and SB-P9-3-2 for laboratory analysis, during the initial field investigation. The soil samples were analyzed for SVOC by EPA Method 8270. One sample from SB-P9-3-1 was also analyzed for the 10 Michigan metals by EPA Method 6020 for all metals except mercury, which was analyzed using EPA Method 7471. An additional sample from SB-P9-3-2 was analyzed for VOC using EPA Method 8260 because solvent odors were noted during boring installation.

One groundwater sample was collected and analyzed for SVOC by EPA Method 625 and VOC by EPA Method 8260 (because of the solvent odors) from temporary monitoring well TW-P9-3-2, installed in the soil boring location of SB-P9-3-2. This sample was collected during the initial field investigation. One groundwater sample was collected and analyzed for VOCs by EPA Method 8260 during the supplemental field investigation.

1.9.4 PAOC 4 - Fire Protection Trench Excavation Area

1.9.4.1 Field Screening

Two soil-boring locations (SB-P9-4-1 and SB-P9-4-2) were chosen to sample the soil in the vicinity of the Fire Protection Trench Excavation. Samples were collected continuously in two-foot intervals to the water table and screened visually and with the TVA-1000, during the initial field investigation. One permanent monitoring well was installed at this PAOC during the supplemental field investigation.

1.9.4.2 Laboratory Analysis Rationale

Four soil samples were collected from soil borings SB-P9-4-1 and SB-P9-4-2 for laboratory analysis, during the initial field investigation. The soil samples were analyzed for SVOC by EPA Method 8270 and for the 10 Michigan metals by EPA Method 6020 for all metals except mercury, which was analyzed using EPA Method 7471.

Groundwater samples were collected and analyzed for SVOC by EPA Method 625 from temporary monitoring wells TW-P9-4-1 and TW-P9-4-2 (installed in soil boring locations SB-P9-4-1 and SB-P9-4-2, respectively). Samples from TW-P9-4-1 and TW-P9-4-2 were also analyzed for the 10 Michigan metals by EPA Method 200.8 for all metals except mercury, which was analyzed using EPA Method 245.1. One groundwater sample was collected and analyzed for SVOCs by EPA Method 8270 and copper by EPA Method 200.8 during the supplemental field investigation.

1.9.5 PAOC 5 - Former Trichloroethylene Degreasing Unit and Sump

1.9.5.1 Field Screening

To determine whether TCE impacts detected in monitoring wells north of the Building 9 property were related to activities at the Former Trichloroethylene Degreasing Unit and Sump, three soil borings were located at the north property boundary (SB-P9-5-1, SB-P9-5-2, and SB-P9-5-3). Samples were collected continuously in two-foot intervals to the water table and screened visually and with the TVA-1000.

Part C - Summary of Phase II Environmental Site Investigation (BBL)

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1.9.5.2 Laboratory Analysis Rationale

Although collection of soil samples was not originally planned at this PAOC, soil staining and odors were observed during boring performance. Therefore a soil sample was collected from SB-P9-5-1 for analysis of VOC and SVOC content by EPA Methods 8260 and 8270, respectively.

During the initial investigation, one groundwater sample was collected and analyzed for SVOC by EPA Method 625 from temporary monitoring well TW-P9-5-1 installed in the boring location of SB-P9-5-1 because a sheen was observed in the soil samples. One groundwater sample was collected and analyzed for SVOC by EPA Method 8260 from temporary monitoring well TW-P9-5-2 installed in the boring location of SB-P9-5-2 as specified in the SAP. During the supplemental field investigation, groundwater samples were collected from monitoring wells MW-P9-5-4 and MW-P9-5 and analyzed for VOCs by EPA Method 8260.

1.10 Health and Safety Monitoring

Investigation activities conducted during the ESI were performed in accordance with BBL's site-specific HASP. The HASP was prepared in accordance with 29 CFR 1910.120 to identify the health and safety procedures, methods, and requirements for activities performed at Flint West.

Personal protective equipment (PPE) and engineering mechanisms were used to reduce direct contact exposure. An exposure monitoring program was implemented and conducted throughout the Property investigation. The ambient levels of total organic vapors were measured by using a TVA-1000. No levels of constituents were detected above the action levels outlined in the HASP.

2. Summary of Results

2.1 Overview

This section summarizes the results of field screening and laboratory analyses.

2.2 Applicable Regulatory Standards

Data generated by the ESI were compared to relevant generic industrial and commercial cleanup criteria contained in OM #14 (MDNR, 1995a) and the criteria contained in the technical support document, "Generic Groundwater Contact Criteria" (MDEQ, 1997). OM #14 soil and groundwater criteria are risk-based cleanup criteria for sites which can be appropriately determined to maintain the designated land use. Current and expected future land use at former Building 9 at Flint West is consistent with the criteria established for the industrial and commercial (subcategory II) exposure scenarios outlined in OM #14. Groundwater analytical data from downgradient sampling locations will be compared to GSI values, while all other groundwater analytical data will be compared to groundwater contact criteria (GCC).

Groundwater data were not compared to health-based or drinking water criteria because the surficial unit is not a usable aquifer. As stated in Section 2.2.3, the State of Michigan Act 451 Part 201 Administrative Rules (R299.5101(c)) and the Code of Federal Regulation (CFR, Part 40, Section 149.2) define an aquifer as "... a geological formation, group of formations, or part (portion) of a formation that is capable of yielding a significant amount of ground water to wells or springs." The thin surficial water bearing unit at the site has a very low transmissivity (10^{-4} to 10^{-5} cm/sec) and does not meet the definition of an aquifer for the following reasons:

1. The unit does not yield enough water for it to be considered an economically viable water source; and,
2. The natural water quality of the surficial water-bearing unit is highly mineralized and is such that extensive treatment would be required prior to use.

The practical definition of an aquifer is further clarified in the book *Groundwater and Wells* as "a saturated bed, formation, or group of formations which yields water in sufficient quantity to be economically useful (Driscoll, 1986)." From an economical standpoint, wells that yield less than approximately 2 gpm are not useful for water supply. Site-specific data collected from the Flint West facility was input into the Cooper-Jacob equation to estimate sustainable flow from the surficial water-bearing unit, as follows:

$$Q = \frac{s T}{264 \log 0.3 \frac{Tt}{r^2 S}}$$

Where Q = pumping rate, gpm

T = transmissivity, gpd/ft = K*b

K = conductivity, gpd/ft²) = 4.2

(site data, BBL, June 1997)

s = drawdown, ft = 5

r = distance from pumping well, ft = 5

t = time since pumping started, days = 365

b = saturated thickness, ft = 5

S = storage coefficient, dimension less = 0.15

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$$Q = \frac{5 \times 21}{264 \log 0.3 \left(\frac{21 \times 365}{5^2 \times 0.15} \right)} = 0.14 \text{ gpm}$$

This projection was verified by data from short-term pumping at monitoring wells installed for a LUST investigation at the nearby Building 2A, which yielded less than one gpm (ES&E, January 8, 1992). This information further supports the determination that the surficial water-bearing unit cannot be considered an aquifer.

A review of well completion records from Genesee County indicated that any wells in the area are screened in the lower confined unit below the impermeable clay layer.

In addition, and as added emphasis, there are several institutional reasons that this water unit could not be used as a potable aquifer, namely:

1. Other much more productive and economically viable aquifer sources are readily available in the area;
2. The surficial unit is not thick enough to support the amount of casing required by the State of Michigan Department of Health for potable wells (25 feet);
3. The Genesee County Health Department prohibits placement of potable wells within the Flint City limits; and,
4. Potable water is readily available throughout the Flint area from the municipal utility and hookup is mandatory.

Representatives of the Genesee County Health Department (personal communication) stated there were no potable water wells drilled to tap the glacial drift since 1967, when records were first required. The glacial deposits are less than 25 feet thick, whereas state regulations (Michigan Drinking Water Regulations, R 325.10818) require that casings for potable water supply wells extend at least 25 feet BLS. Personnel from the City of Flint Water Services stated that hookup to the municipal water supply is mandatory within City limits (Flint City Code, Section 46-25).

Accordingly, the surficial unit is not an aquifer, the ingestion pathway is not complete and health-based and aesthetic drinking water criteria are not applicable to Site groundwater. Exposure pathways to be considered for groundwater include direct contact (dermal and ingestion) and discharge to surface water.

2.2.1 Potential Exposure Pathways for Soil

Exposure pathways to be considered for soil include direct contact (dermal and ingestion), inhalation of fugitive dust, inhalation of volatile emissions, surface runoff and erosion, inhalation of particulate soils in the upper six-inches of the soil column, and migration to groundwater.

The residential and some subcategories of commercial exposure scenarios assume that children are ingesting the soil. However, the Property is expected to remain industrial or commercial subcategory II, III, or IV land use so, the ingestion pathway for soil can be eliminated.

Mobilization to potable groundwater is also a potential ingestion pathway for soil contamination, but because groundwater quality was directly evaluated by analysis of groundwater samples collected in each PAOC,

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comparison of soil data to soil water partitioning (SWP) criteria was not necessary. Further, as discussed in Part C Section 2.2, groundwater in the surficial unit is not a potable water source either on the property or off-site; therefore soil protective-of-groundwater criteria are not applicable at Flint West. Soil protective-of-surface water criteria may be applicable, if groundwater venting to surface water exceeds GSI criteria and groundwater remediation is not implemented.

Because impacted soil at the property is covered with either asphalt or concrete, inhalation of fugitive dust, surface runoff, and erosion can be eliminated as complete exposure pathways at this time. However, soil data have been compared to draft volatile soil inhalation criteria (VSIC) and particulate soil inhalation criteria (PSIC) to determine the risk should the cover be removed at some time in the future.

Exposure of Property workers to soil impacts by dermal contact is a potentially complete pathway. Soil concentrations at the Property were compared to direct contact values (DCVs).

2.2.2 Potential Exposure Pathways for Groundwater

Exposure pathways to be considered for groundwater include direct contact (dermal and ingestion) and discharge to surface water. As discussed above in Part C Section 2.2, the surficial unit is not a useable aquifer. Therefore, the ingestion pathway is not complete, and health-based and aesthetic drinking water criteria are not applicable to Property groundwater.

Dermal contact with groundwater by utility workers has been considered in developing the Utility Worker groundwater contact criteria (GCC) recently published by MDEQ in a technical support document (MDEQ, 1997). Because this is a potential exposure pathway at Flint West, groundwater concentrations have been compared to these values.

Groundwater venting to surface water is a viable pathway to consider for groundwater. If the groundwater samples collected from down-gradient wells on-site contain contaminant concentrations above GSI criteria, additional groundwater samples can be collected from monitoring wells closer to or adjacent to the Flint River to determine if concentrations meet GSI values.

2.3 PAOC 1 -The Electrical Substation

2.3.1 Field Screening Results

Analysis of organic vapor content in the headspace of soil samples collected in the Electrical Substation area was performed on March 24, 1997, during the initial field investigation. Organic vapors were present in the samples at levels less than ten parts per million (ppm). The field screening data are summarized in Table C-2.

2.3.2 Laboratory Analytical Data

2.3.2.1 Unsaturated Soil

SVOC concentrations in soil from the Electrical Substation area are BDL. Table C-3 is a summary of the organic compounds detected in soil. Metals concentrations in soil from the Electrical Substation area are below MDEQ Soil Inhalation Criteria (SIC) and DCVs. Therefore, this area is no longer considered a PAOC for soil. Table C-4 is a summary of the analytical data for metals in soil.

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2.3.2.2 Groundwater

Groundwater was sampled from temporary well TW-P9-1-1 for SVOC analysis on March 24, 1997, during the initial field investigation. Concentrations of the SVOC compounds are BDL in the groundwater from PAOC 1. Therefore, this area is no longer considered a PAOC for groundwater. Table C-6 is a summary of organic compounds in groundwater.

2.4 PAOC 2 - Stormwater Pump and Sump in North Storage Area

2.4.1 Field Screening Results

Analysis of organic vapor content in the headspace of soil samples collected in the Stormwater Sump and Pump area was performed on March 25, 1997, during the initial field investigation. With the exception of the sample from SB-P9-2-3 [12-14 feet BLS], which had a net hydrocarbon vapor concentration of 36.8 ppm, organic vapors were present in the samples at levels less than ten ppm. The field screening data are summarized in Table C-2.

2.4.2 Laboratory Analytical Data

2.4.2.1 Unsaturated Soil

SVOC concentrations in soil from the Stormwater Sump and Pump area were below laboratory detection limits (BDL). Table C-3 is a summary of the organic compounds detected in soil. Metals concentrations in soil from the Stormwater Sump and Pump area are below MDEQ SIC and DCVs. Therefore, this area is no longer considered a PAOC for soil. Table C-4 is a summary of the analytical data for metals in soil. The soil investigation for this PAOC was completed during the initial field investigation.

2.4.2.2 Groundwater

Groundwater was sampled from temporary well TW-P9-2-3 for SVOC analysis on March 24, 1997, during the initial field investigation. Concentrations of the SVOC compounds were BDL in the groundwater from PAOC 2. Therefore, this area is no longer considered a PAOC for groundwater. Table C-6 is a summary of organic compounds in groundwater.

2.5 PAOC 3 - Gravel Area, Northwest Side of Building

2.5.1 Field Screening Results

Analysis of organic vapor content in the headspace of soil samples collected in the Gravel Area was performed on March 25, 1997, during the initial field investigation. Organic vapors were present in the samples at levels less than ten ppm. The field screening data are summarized in Table C-2.

2.5.2 Laboratory Analytical Data

2.5.2.1 Unsaturated Soil

SVOC concentrations in soil from the Gravel area were BDL in all samples except those from SB-P9-3-1 (0.5-2 feet BLS). SVOC concentrations ranged from 520 micrograms per kilogram ($\mu\text{g}/\text{kg}$) of fluorene to 8,000 $\mu\text{g}/\text{kg}$

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of chrysene. However, these concentrations were below SIC and DCVs. Because solvent odors were noted in the soil in this area, samples from the 14-16 foot BLS interval in SB-P9-3-1 and the 10-12 foot BLS interval in SB-P9-3-2 were collected for VOC analysis. Cis-1,2-dichloroethene and trichloroethene were detected in SB-P9-3-1 at 180 and 670 $\mu\text{g/kg}$, respectively. However, these concentrations are below SIC and DCVs. Table C-3 is a summary of the organic compounds in soil. Metals concentrations in soil from the Gravel area were also below MDEQ SIC and DCVs. Therefore, this area is no longer considered a PAOC for soil. Table C-4 is a summary of the analytical data for metals in soil.

2.5.2.2 Groundwater

Groundwater was sampled from temporary well TW-P9-3-2 for VOC and SVOC analysis on March 25, 1997, during the initial field investigation. Concentrations of the SVOC compounds were BDL. Cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride were present in groundwater samples at 120, 7, 71, and 1 micrograms per liter ($\mu\text{g/L}$), respectively. These concentrations are below GCC and GSI values. Concentrations of the remaining VOC compounds were BDL. Table C-6 is a summary of organic compounds in groundwater.

During the initial field investigation, samples used for VOC analysis were drawn from 1 liter amber bottles. To confirm the VOC data, during the supplemental field investigation, a groundwater sample from monitoring well MW-P9-3-3 was analyzed for VOCs by EPA Method 8260. Concentrations of 1,1-dichloroethane, cis-1,2-dichloroethene (DCE), methyl-tert-butyl ether (MTBE), trichloroethene (TCE), and vinyl chloride were present at 4 $\mu\text{g/L}$, 1,000 $\mu\text{g/L}$, 120 $\mu\text{g/L}$, 350 $\mu\text{g/L}$, and 190 $\mu\text{g/L}$, respectively. Concentrations of other VOCs included in EPA Method 8260 were reported below detection limits. Concentrations of vinyl chloride and TCE in the groundwater sample from monitoring well MW-P9-3-3 exceeded the GSI criteria of 15 $\mu\text{g/L}$ and 200 $\mu\text{g/L}$, respectively. No other compounds exceeded GSI criteria. None of the detected compounds exceed GCC values. The laboratory analytical results are presented in Table C-6 and shown in Figure C-2.

2.6 PAOC 4 - Fire Protection Trench Excavation

2.6.1 Field Screening Results

Analysis of organic vapor content in the headspace of soil samples collected in the Fire Protection Trench Excavation area was performed on March 26, 1997, during the initial field investigation. Net hydrocarbon vapor concentrations ranged from 0 to 59.16 ppm. The field screening data are summarized in Table C-2.

2.6.2 Laboratory Analytical Data

2.6.2.1 Unsaturated Soil

SVOC concentrations in soil from the Fire Protection Trench Excavation area ranged from BDL to 23,000 $\mu\text{g/kg}$ of phenanthrene in SB-P9-4-1, and from BDL to 18,000 $\mu\text{g/kg}$ of pyrene in SB-P9-4-2. However, the concentrations are below MDEQ SIC and DCVs. Table C-3 is a summary of the organic compounds detected in soil. Metals concentrations in soil from the Fire Protection Trench Excavation area are also below MDEQ SIC and DCVs. Table C-4 is a summary of the analytical data for metals in soil.

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2.6.2.2 Groundwater

Groundwater was sampled from temporary well TW-P9-4-2 for SVOC analysis on March 25, 1997, during the initial field investigation. Concentrations of SVOCs exceeded GSI criteria and GCC, as shown in Table C-5. However, Building 9 is not at the GSI, and concentrations of the SVOCs should be evaluated in groundwater samples from downgradient monitoring wells between the potential source areas and the Flint River. The concentrations of SVOCs exceeding GCC are suspect because they are several orders of magnitude higher than the theoretical solubility in water.

During the initial field investigation, concentrations of dissolved copper and selenium exceeded GSI values in groundwater samples collected in PAOC 4. As stated above, Building 9 is not at the GSI, and concentrations of these chemicals should be evaluated in groundwater samples from downgradient monitoring wells between the potential source area and the Flint River. Metals concentrations in the groundwater samples did not exceed GCC. Table C-5 is a summary of metals concentrations in groundwater.

During the supplemental field investigation, groundwater samples collected from monitoring well MW-P9-4-3 were analyzed for SVOCs by EPA Method 8270 and copper by EPA Method 200.8. SVOCs and copper were reported below laboratory detection limits in this groundwater sample. Free oil was not observed in this monitoring well over the course of the field investigation.

2.7 PAOC 5 - Former Trichloroethylene Degreasing Unit and Sump

2.7.1 Field Screening Results

Analysis of organic vapor content in the headspace of soil samples collected downgradient from the Former Trichloroethylene Degreasing Unit area was performed on March 26, 1997, during the initial field investigation. Net hydrocarbon vapor concentrations ranged from 0.4 to 404.6 ppm. Organic vapor concentrations greater than 5 ppm were only present in two moist samples collected near the water table, and are attributed to VOC concentrations in groundwater. The field screening data are summarized in Table C-2.

2.7.2 Laboratory Analytical Data

2.7.2.1 Unsaturated Soil

Although collection of soil samples for laboratory analysis was not originally planned in PAOC 5, soil samples were collected from SB-P9-5-1 for SVOC and VOC analysis because a sheen was noted on the soil during boring installation. However, VOC and SVOC concentrations in soil from the Former Trichloroethylene Degreasing Unit area were BDL. Therefore, this area is no longer considered a PAOC for soil. Table C-3 is a summary of the organic compounds in soil.

2.7.2.2 Groundwater

Groundwater was sampled from temporary well TW-P9-5-1 for SVOC analysis and from TW-P9-5-2 for VOC analysis on March 26, 1997, during the initial field investigation. Concentrations of the SVOC compounds were BDL. Cis-1,2-dichloroethene was detected at 1 µg/L. The remaining VOC concentrations were BDL. Table C-6 is a summary of organic compounds in groundwater.

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confirm the VOC data, during the supplemental field investigation, groundwater samples collected from monitoring wells MW-P9-5-4 and MW-P9-5-5 were analyzed for VOCs by EPA Method 8260. Cis-1,2-dichloroethene was detected in the groundwater samples from MW-P9-5-4 and MW-P9-5-5 at concentrations of 310 $\mu\text{g/L}$ and 150 $\mu\text{g/L}$, respectively. TCE was detected in the groundwater samples from MW-P9-5-4 and MW-P9-5-5 at concentrations of 15 $\mu\text{g/L}$ and 110 $\mu\text{g/L}$, respectively. Vinyl chloride was also detected in the groundwater sample from MW-P9-5-5 at a concentration of 7 $\mu\text{g/L}$. Concentrations of other VOCs included in EPA Method 8260 were reported below detection limits. The concentrations of VOC compounds detected in the two groundwater samples did not exceed GSI criteria or GCC. The laboratory analytical results are presented in Table C-6 and shown in Figure C-2.

2.8 Quality Assurance/Quality Control

2.8.1 Field Screening Data

The Work Plan outlined the analytical reporting levels and data quality objectives proposed for the ESI. Field screening techniques used for the ESI consisted of TVA-1000 Toxic Vapor Analyzer. The field screening instruments were properly calibrated in accordance with accepted practices and manufacturer's calibration procedures. The calibration data was recorded in calibration logs associated with each instrument. A typical analysis sequence consisted of the following:

- a calibration check sample (to verify the calibration);
- a blank sample (to verify instrument integrity);
- project samples (one to twenty); and
- duplicate samples.

In addition, if a concentrated sample was analyzed, a blank sample would be analyzed afterwards to verify instrument integrity.

QA/QC data for the field screening instruments were reported as acceptable.

2.8.2 Laboratory Analytical Data

As stipulated in the project-specific QAPP, the data was validated by the QA Officer following EPA Functional Data Validation Guidelines and the appropriate DQOs and analytical data levels. Sampling procedures were determined to be complete and acceptable, and results of laboratory QA/QC samples were within acceptable limits. Data validation reports indicated that the laboratory data can be used for quantitative purposes in almost all cases. OM #6 target method detection limits were achieved except in cases where dilution of the sample was necessary due to elevated concentrations of some constituents.

3. Conclusions and Recommendations Based on Environmental Site Investigation

BBL performed this Phase II ESI at the former Building 9 of the Delphi-Flint West Facility to further investigate areas identified in the ESA. Soil borings, temporary wells, and permanent monitoring wells were installed at five PAOCs previously identified in Part B of this report. Groundwater and soil samples were collected for analysis of VOC, SVOC, and metals. Conclusions and recommendations for each PAOC based on the results of the investigation are discussed in the following sections.

3.1 PAOC 1 - The Electrical Substation

During the Phase I ESA Free oil had been observed seeping through a floor seam in this area, soil and groundwater samples collected in this area were analyzed for SVOC, and soil samples were analyzed for metals. SVOC were not detected in soil or groundwater, and the metals concentrations in the soil were below SIC and DCVs, the appropriate regulatory comparison values. Therefore, this area is no longer considered a PAOC for soil or groundwater.

3.2 PAOC 2 - Stormwater Pump and Sump in North Storage Area

During the Phase I ESA an oil spill had been reported in this area, soil and groundwater samples collected in this area were analyzed for SVOC, and soil samples were analyzed for metals. SVOC were not detected in soil or groundwater, and the metals concentrations in the soil were below SIC and DCVs. Therefore, this area is no longer considered a PAOC for soil or groundwater.

3.3 PAOC 3 - Gravel Area, Northwest Side of Building

During the Phase I ESA oil staining had been observed on stairs leading to the Gravel Area, soil and groundwater samples collected in this area were analyzed for SVOC, and soil samples were analyzed for metals. SVOC were not detected above appropriate regulatory comparison values in soil or groundwater, and the metals concentrations in the soil were below SIC and DCVs.

During the initial field investigation, an obvious solvent odor had been noted in this area during soil boring installation, a soil sample and groundwater sample were collected for VOC analysis. VOC were not detected above appropriate regulatory comparison values in soil. Groundwater samples contained cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride at 120, 7, 71, and 1 $\mu\text{g/L}$, respectively. These concentrations are below GCC and GSI values. Concentrations of the remaining VOC compounds were BDL. However, a problem with the laboratory containers yielded potentially unreliable VOC data in the groundwater.

During the supplemental field investigation, VOCs were detected in the groundwater sample collected from this PAOC. However, only vinyl chloride and TCE were reported at a concentration that exceeded GSI criteria. Two shallow monitoring wells (P7-1 and P7-2) are present down-gradient of Building 9 (Figure C-2A). The monitoring wells are located in the vicinity of former underground storage tanks (USTs) 14 and 15 at Building 7. The wells were installed after the USTs were removed. Vinyl chloride and TCE were not detected in the most recent groundwater samples collected from these monitoring wells. The sampling event was conducted by Environmental Consulting & Technology, Inc. (ECT) in March 1995 and summarized in a tank closure report (ECT, 1995).

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Therefore, this area can be eliminated as a PAOC because the groundwater quality in a downgradient monitoring well meets GSI criteria.

3.4 PAOC 4 - Fire Protection Trench Excavation Area

During the Phase I ESA Free oil had been observed seeping into the Fire Trench Excavation, soil and groundwater samples collected in this area were analyzed for SVOC and metals. SVOC and metals were not detected in soil above SIC and DCVs, the appropriate regulatory comparison values.

During the initial field investigation, SVOC compounds were detected above GCC and GSI values in groundwater samples in PAOC 4. Dissolved metals concentrations in groundwater samples field filtered with a 1-micron filter were also above GSI values. However, Building 9 is not at the GSI, and concentrations of these constituents should be evaluated in groundwater samples from downgradient monitoring wells between this PAOC and the Flint River. A permanent monitoring well should be installed in PAOC 4 to determine whether Free oil is present, and groundwater should be resampled for SVOC compounds. If the presence of SVOC's above the GCC are confirmed in the groundwater, additional groundwater monitoring points should be installed to define the extent of groundwater exceeding the GCC. If additional monitoring points are installed, additional soil samples should be collected for SVOC analysis.

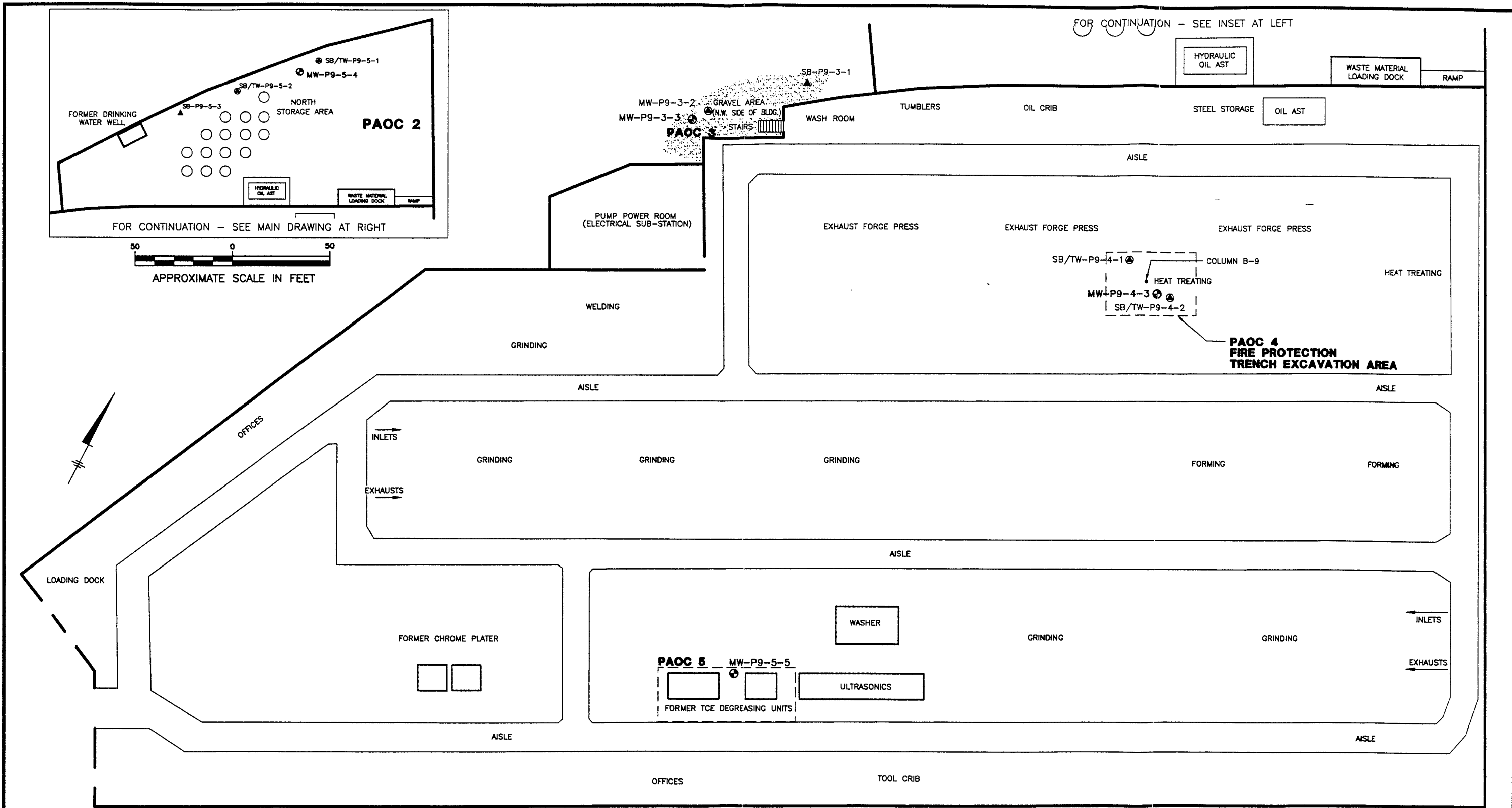
During the supplemental field investigation, SVOCs, and copper were not detected in the groundwater sample collected from this PAOC. It appears that the SVOC and copper impacts are localized to the temporary well point location installed during the initial ESI field work. Free oil was not detected in this monitoring well over the course of this investigation. BBL recommends no further action at this PAOC at present. However, monitoring well MW-P9-4-3 should be gauged for free oil during future activities at the Property. The clay and silt-clay material beneath the Property may be restricting the flow of free oil in the subsurface. If free oil does not appear in this well within three months, this area can be eliminated as a PAOC.

3.5 PAOC 5 - Former Trichloroethylene Degreasing Unit and Sump

During the Phase I ESA there was a documented spill of TCE in the degreasing unit, and concentrations of TCE had been detected in a downgradient monitoring well, soil and groundwater samples were collected from three locations along the property boundary for soil screening and laboratory analysis of VOC content. Additional soil and groundwater samples were also collected for laboratory analysis of SVOC when a sheen was observed on soil samples during boring performance. SVOC and VOC were not detected in soil. Therefore, this area is no longer considered a PAOC for soil.

During the initial field investigation, SVOC were not detected in groundwater, and only cis-1,2-dichloroethene was detected at 1 $\mu\text{g/L}$ in groundwater. However, a problem with the laboratory containers yielded potentially unreliable VOC data in the groundwater. VOC concentrations were confirmed with an additional temporary well installed during the supplemental field investigation. Also, as noted in Part C Section 3.3, the presence of trichloroethylene in groundwater samples from PAOC 3 suggests that releases from the former trichloroethylene degreasing units may have impacted the ground water, in contrast to reports that the releases were contained. A temporary well was installed during the supplemental field investigation in the vicinity of the former degreasing units and analyzed for VOC. VOCs were detected in the groundwater samples collected from this PAOC during the supplemental field investigation. However, none of the detected compounds were above applicable regulatory criteria. Consequently, this area can be eliminated as a PAOC.

PART C - FIGURES



LEGEND

- ▲ SOIL BORING
- ⊕ TEMPORARY WELL
- ⊙ MONITORING WELL

P: 48061009
11/19/97 BOC-54 MAJ, APO
48076050/BASE-ESA/48076066.DWG

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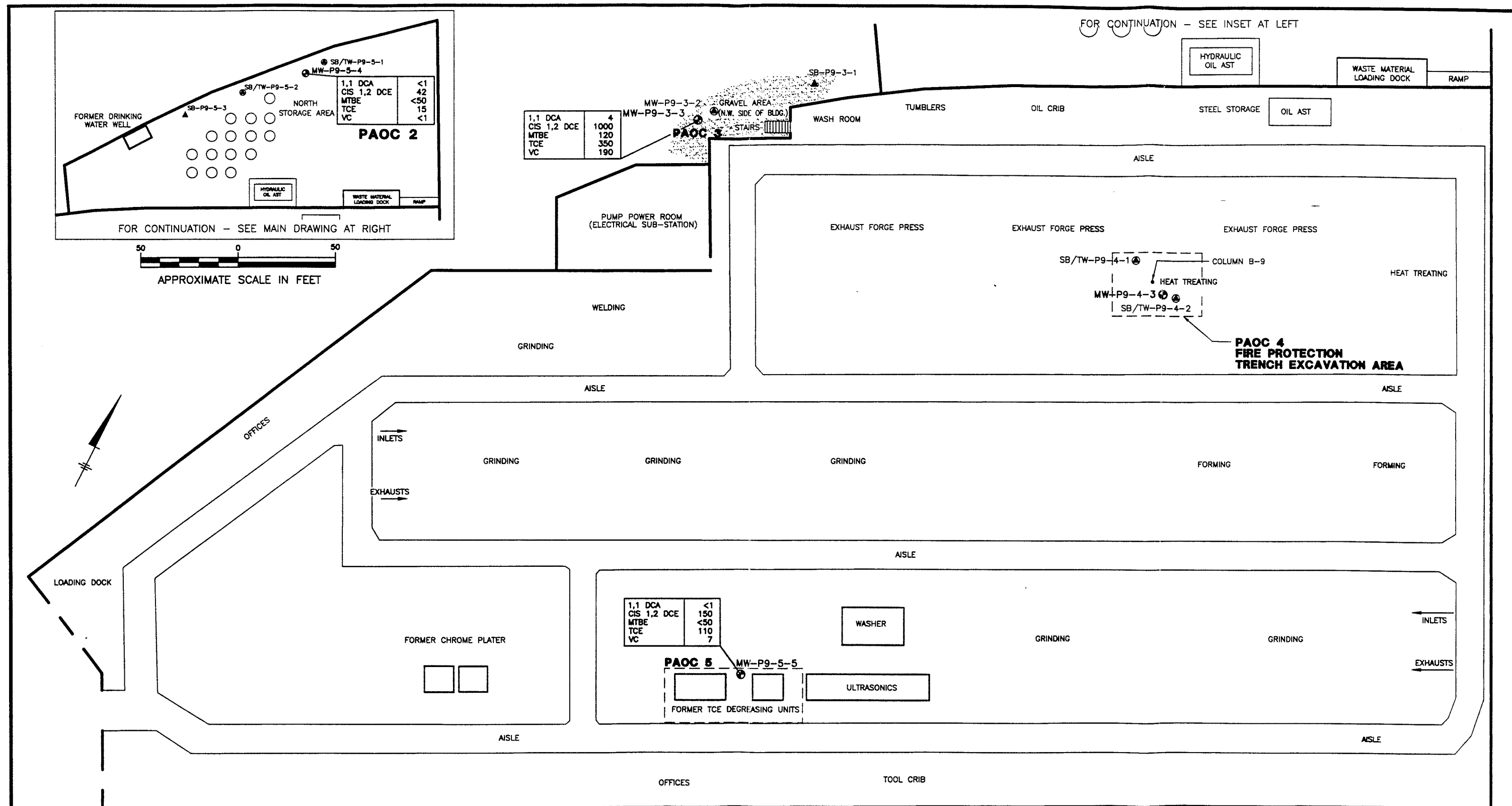
BASE MAP SOURCE: GENERAL MOTORS, FLINT, MICHIGAN - GENERAL ARRANGEMENT DWG - WPEC

GENERAL MOTORS CORPORATION
BUILDING 9 DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN
BASELINE ENVIRONMENTAL SITE ASSESSMENT

SITE MAP

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
C-1



LEGEND

- ▲ SOIL BORING
- ⊙ TEMPORARY WELL
- ⊕ MONITORING WELL

1,1 DCA = 1,1 DICHLOROETHANE
 CIS 1,2 DCE = CIS 1,2 DICHLOROETHENE
 MTBE = METHYL-TERT-BUTYL ETHER
 TCE = TRICHLOROETHENE
 VC = VINYL CHLORIDE

CONCENTRATIONS IN
 MICROGRAMS PER LITER

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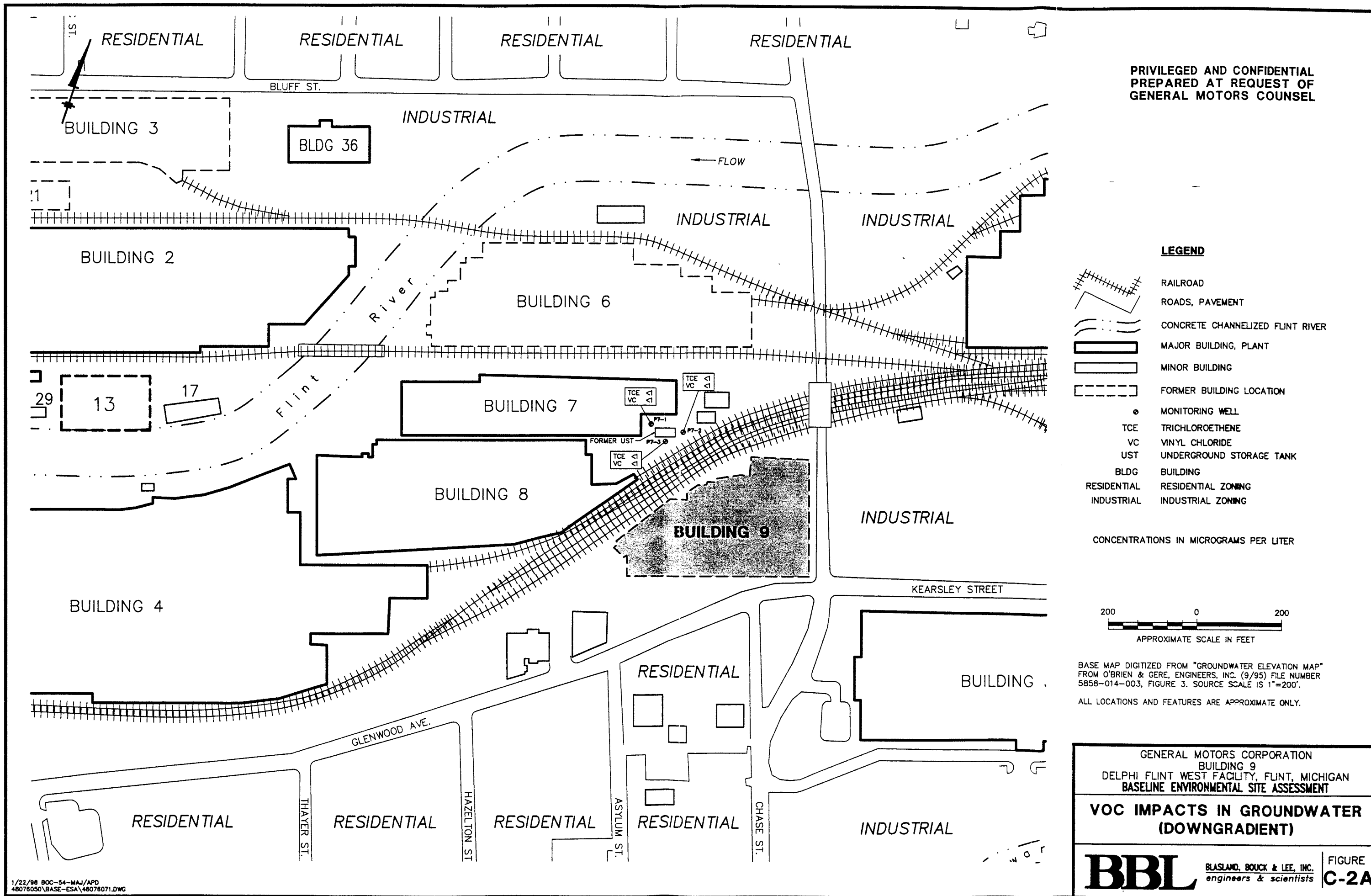
BASE MAP SOURCE: GENERAL MOTORS, FLINT, MICHIGAN - GENERAL ARRANGEMENT DWG - MPEC

GENERAL MOTORS CORPORATION
 BUILDING 9 DELPHI-FLINT WEST FACILITY
 FLINT, MICHIGAN
 BASELINE ENVIRONMENTAL SITE ASSESSMENT

VOC IMPACTS IN GROUNDWATER

BBL BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
 C-2



PART C - TABLES

TABLE C-1
SAMPLING AND ANALYSIS SUMMARY
BASELINE ENVIRONMENTAL SITE ASSESSMENT

BUILDING 9, FLINT WEST FACILITY
FLINT, MICHIGAN

PAOC	Location	Chemicals of Concern	Field Screening Methods	Sampling Rationale And Location	Laboratory Analyses Soils	Laboratory Analyses Groundwater
1	Electrical substation on northwest corner of Building 9.	LNAPL	TVA - Soil samples collected in 2-foot intervals.	Two soil borings will be installed in the area which comprises approximately 200 sq. ft. Soil samples will be collected in 2-foot intervals from land surface to the water table. The sample from 0 to 2 feet below land surface will be divided into samples from 0 to 0.5 feet and 0.5 feet to 2 feet. Fourteen samples will be collected (seven from each boring). Up to two temporary well points will be installed with the geoprobe for collection of groundwater samples.	Two samples from each boring will be analyzed by EPA Method 8270. The 0 to 0.5 foot samples will be analyzed for each boring. The remaining sample from each boring with the highest TVA reading (or most visible hydrocarbon impacts) will also be analyzed by EPA method 8270.	If screening of soils indicate there are potential groundwater impacts, up to two groundwater samples will be analyzed by EPA Method 8270.
2	Stormwater pump and sump located in the north storage area.	LNAPL	TVA - Soil samples collected in 2-foot intervals.	Three soil borings will be installed along the areas identified where oil has leaked as a result of overflow from the northeast catch basin. Soil samples will be collected in 2-foot intervals from land surface to the water table. The sample from 0 to 2 feet below land surface will be divided into samples from 0 to 0.5 feet and 0.5 feet to 2 feet. Twenty-one samples will be collected (seven from each boring). Up to three temporary well points will be installed with the geoprobe for collection of groundwater samples.	Two samples from each boring will be analyzed by EPA Method 8270. The 0 to 0.5 foot samples will be analyzed for each boring. The remaining sample from each boring with the highest TVA reading (or most visible hydrocarbon impacts) will also be analyzed by EPA method 8270.	If screening of soils indicate there are potential groundwater impacts, up to three groundwater samples will be analyzed by EPA Method 8270.
3	Northwest side of building gravel area.	LNAPL	TVA - Soil samples collected in 2-foot intervals.	Two soil borings will be installed in the area which comprises approximately 500 sq. ft. Soil samples will be collected in 2-foot intervals from land surface to the water table. The sample from 0 to 2 feet below land surface will be divided into samples from 0 to 0.5 feet and 0.5 feet to 2 feet. Fourteen samples will be collected (seven from each boring). Up to two temporary well points will be installed with the geoprobe for collection of groundwater samples.	Two samples from each boring will be analyzed by EPA Method 8270. The 0 to 0.5 foot samples will be analyzed for each boring. The remaining sample from each boring with the highest TVA reading (or most visible hydrocarbon impacts) will also be analyzed by EPA method 8270.	If screening of soils indicate there are potential groundwater impacts, up to two groundwater samples will be analyzed by EPA Method 8270. The groundwater sample if any, will also be analyzed by EPA Method 8260, as this area is between the degreasing unit and the location downgradient where TCE was detected.
4	Fire Protection Trench Excavation	LNAPL	TVA - Soil samples collected in 2-foot intervals.	Two soil borings will be installed in the vicinity of Column B-9 (fire trench excavation). Soil samples will be collected in 2-foot intervals from land surface to the water table. The sample from 0 to 2 feet below land surface will be divided into samples from 0 to 0.5 feet and 0.5 feet to 2 feet. Fourteen samples will be collected (seven from each boring). Up to two temporary well points will be installed with the geoprobe for collection of groundwater samples.	Two samples from each boring will be analyzed by EPA Method 8270 and for the ten Michigan metals. The 0 to 0.5 foot samples will be analyzed for each boring. The remaining sample from each boring with the highest TVA reading (or most visible hydrocarbon impacts) will also be analyzed by EPA method 8270 and the 10 Michigan metals.	If screening of soils indicate there are potential groundwater impacts, up to two groundwater samples will be analyzed by EPA Method 8270 and the 10 Michigan metals. If product is encountered, a sample will be collected and analyzed by fingerprint analysis.
5	Former trichloroethylene degreasing unit and sump.	TCE	TVA - Soil samples collected in 2-foot intervals.	Three soil borings will be installed along the northern property boundary, between the degreasing and where TCE was detected in groundwater during an UST removal. Soil samples will be collected in 2-foot intervals from land surface to the water table. Up to three temporary points will be installed with the geoprobe for collection of groundwater samples.	No laboratory analysis of soil samples	If screening of soils indicate there are potential groundwater impacts, up to three groundwater samples will be analyzed by EPA Method 8260.

TABLE C-2
ORGANIC VAPOR ANALYSIS
FIELD SCREENING RESULTS
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Sample Location	Date	Sample Interval (Feet Below Grade)	Total Organic Vapor Concentration (ppm)	Methane/Ethane Vapor Concentration* (ppm)	Net Hydrocarbon Vapor Concentration (ppm)
SB-P9-1-1	3/24/97	0-0.5	4	2.1	1.9
		0.5-2	3.3	2.56	0.74
		2-4	3	2.45	0.55
		4-6	2.74	2.45	0.29
		6-8	2.8	2.52	0.28
		8-10	2.96	2.43	0.53
		10-12	2.6	2.5	0.1
		12-14	3.13	2.74	0.39
SB-P9-1-2	3/24/97	14-16	3.33	2.56	0.77
		0-0.5	2.92	2.68	0.24
		0.5-2	2.74	2.82	0
		2-4	2.8	2.65	0.15
		4-6	2.98	2.62	0.36
		6-8	2.83	2.76	0.07
		8-10	2.78	2.7	0.08
		10-12	2.96	2.68	0.28
SB-P9-2-1	3/25/97	12-14	4.25	2.58	1.67
		14-16	6.27	2.6	3.67
		0-0.5	0.6	1.17	0**
		0.5-2	9.89	1.03	8.86
		2-4	5.3	0.56	4.74
		4-6	4.31	0.49	3.82
SB-P9-2-2	3/25/97	6-8	2.92	0.35	2.57
		8-10	0	0.42	0**
		10-12	2.52	0.56	1.96
		0-0.5	3.18	1.11	2.07
		0.5-2	1.64	1.08	0.56
		2-4	2.04	1.06	0.98
		4-6	1.47	1.11	0.36
		6-8	1.46	1.15	0.31
		8-10	1.7	1.12	0.58
		10-12	1.75	1.18	0.57

Note:

* - Readings taken with headspace gas filtered through charcoal.

** - A net concentration of less than zero is sometimes recorded due to accuracy of the OVA or sample inhomogeneity. These values have been replaced with zero.

*** - Sample moist.

TABLE C-2
ORGANIC VAPOR ANALYSIS
FIELD SCREENING RESULTS
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Sample Location	Date	Sample Interval (Feet Below Grade)	Total Organic Vapor Concentration (ppm)	Methane/Ethane Vapor Concentration* (ppm)	Net Hydrocarbon Vapor Concentration (ppm)
SB-P9-2-3	3/25/97	0-0.5	0.44	0	0.44
		0.5-2	0.46	0	0.46
		2-4	0.35	0	0.35
		4-6	0	0	0
		6-8	0.89	0	0.89
		8-10	0.74	0	0.74
		10-12	7.68	5.81	1.87
		12-14	48.71	11.92	36.79
		14-16	0.1	1.78	0**
SB-P9-3-1	3/25/97	0-0.5	0	0.44	0**
		0.5-2	1.81	1.31	0.5
		2-4	1.2	1.36	0**
		4-6	0.7	1.23	0**
		6-8	0.85	0.8	0.05
		8-10	1	0.96	0.04
		10-12	0.98	0.8	0.18
		12-14	3.33	1.23	2.1
		14-16	8.85	7.96	0.89
SB-P9-3-2	3/25/97	0-0.5	0.77	0	0.77
		0.5-2	0.72	0.44	0.28
		2-4	0.66	0.43	0.23
		4-6	5.49	0	5.49
		6-8	1.01	0.22	0.05
		8-10	1.03	0.22	0.81
		10-12	1.75	0.66	1.09
SB-P9-4-1	3/26/97	0-0.5	9.62	4.33	5.29
		0.5-2	9.1	3.03	6.07
		2-4	16.24	8.36	7.88
		4-6	47.71	24.89	22.82
		6-8	70	56.45	13.55
		8-10	90.5	90.1	0.4
		10-12	37.01	12.3	24.71
		12-14	83.56	24.72	58.84
		14-16	66.31	31.85	34.46
		16-18	38.75	80.6	0**
		18-20	42.13	19.61	22.52

Note:

* - Readings taken with headspace gas filtered through charcoal.

** - A net concentration of less than zero is sometimes recorded due to accuracy of the OVA or sample inhomogeneity. These values have been replaced with zero.

*** - Sample moist.

TABLE C-2
ORGANIC VAPOR ANALYSIS
FIELD SCREENING RESULTS
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Sample Location	Date	Sample Interval (Feet Below Grade)	Total Organic Vapor Concentration (ppm)	Methane/Ethane Vapor Concentration* (ppm)	Net Hydrocarbon Vapor Concentration (ppm)
SB-P9-4-2	3/26/97	0-0.5	0.73	0.59	0.14
		0.5-2	6	0.5	5.5
		2-4	NS	NS	0
		4-6	28.1	1.63	26.47
		6-8	82.3	23.14	59.16
		8-10	40.66	18.96	0.4
		10-12	8.88	9.69	0**
SB-P9-5-1	3/26/97	0-0.5	1.5	0	1.5
		0.5-2	1.56	0	1.56
		2-4	1.6	0	1.6
		4-6	1.67	0	1.67
		6-8	1.64	0	1.64
		8-10	1.99	0	0.4
		10-12***	458	53.4	404.6
SB-P9-5-2	3/26/97	0-0.5	1.79	1.65	0.14
		0.5-2	1.98	1.46	0.52
		2-4	2.12	1.48	0.64
		4-6	2.02	1.38	0.64
		6-8	2.06	1.51	0.55
		8-10	1.94	1.47	0.4
		10-12***	453	71.34	381.66
SB-P9-5-3	3/26/97	0-0.5	1.88	1.44	0.44
		0.5-2	1.97	1.45	0.52
		2-4	1.91	1.41	0.5
		4-6	1.87	1.39	0.48
		6-8	1.91	1.68	0.23
		8-10	1.94	1.6	0.4
		10-12***	2.01	1.68	0.33

Note:

* - Readings taken with headspace gas filtered through charcoal.

** - A net concentration of less than zero is sometimes recorded due to accuracy of the OVA or sample inhomogeneity. These values have been replaced with zero.

*** - Sample moist.

TABLE C-3
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification					Industrial Unlimited Land Use PSIC	Industrial Infinite Source VSIC	Generic Industrial Commercial Cleanup Subcategory II DCC	Generic Csat
		SB-P9-1-1 (0-6")	SB-P9-1-1 (8-10')	SB-P9-1-2 (0-6")	SB-P9-1-2 (14-16')	SB-P9-2-1 (0-6")				
<i>EPA Method 8270</i>										
Acenaphthene	ug/kg	<330	<330	<330	<330	<330	6.2E+09	9.7E+07	8.1E+08	NA
Anthracene	ug/kg	<330	<330	<330	<330	<330	2.9E+10	1.6E+09	1.0E+09	NA
Benzo(a)anthracene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+05	NA
Benzo(a)pyrene	ug/kg	<330	<330	<330	<330	<330	1.9E+06	NLV	2.1E+04	NA
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	<330	<330	ID	ID	2.1E+05	NA
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+06	NA
Benzo(g, h, i)perylene	ug/kg	<330	<330	<330	<330	<330	3.5E+08	NLV	1.6E+07	NA
Chrysene	ug/kg	<330	<330	<330	<330	<330	ID	ID	2.1E+07	NA
Dibenzo(a, h)anthracene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+04	NA
Dibenzofuran	ug/kg	<330	<330	<330	<330	<330	ID	ID	ID	NA
Fluoranthene	ug/kg	<330	<330	<330	<330	<330	4.1E+09	8.8+08	5.4E+08	NA
Fluorene	ug/kg	<330	<330	<330	<330	<330	4.1E+09	1.5E+08	5.4E+08	NA
Indeno (1,2,3)pyrene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+05	NA
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	ID	ID	1.6E+08	NA
Naphthalene	ug/kg	<330	<330	<330	<330	<330	1.5E+10	5.9E+07	1.6E+08	NA
Phenanthrene	ug/kg	<330	<330	<330	<330	<330	5.9E+07	1.5E+05	1.6E+07	NA
Pyrene	ug/kg	<330	<330	<330	<330	<330	2.9E+09	7.7E+08	3.4E+08	NA
<i>EPA Method 8260</i>										
Cis-1,2-dichloroethene	ug/kg	SNA	SNA	SNA	SNA	SNA	2.3E+11	4.7E+07	6.5E+05	6.4E+05
Trichloroethene	ug/kg	SNA	SNA	SNA	SNA	SNA	2.3E+09	2.6+05	5.0E+05	5.0E+05

Notes:

ug/kg - micrograms per kilogram
NA - Not applicable
NLV - Not likely to volatilize
ID - Inadequate data to develop criterion
PSIC - Particulate Soil Inhalation Criteria
VSIC - Volatile Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration

SNA - Sample not analyzed for this compound
Samples collected March 1997

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE C-3
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification						Industrial Unlimited Land Use PSIC	Industrial Infinite Source VSIC	Generic Industrial Commercial Subcategory II Cleanup DCV	Generic Csat
		SB-P9-2-1 (6'-2')	SB-P9-2-2 (0-6')	SB-P9-2-2 (2-4')	SB-P9-2-2 (0-6')	SB-P9-2-3 (10-12')					
EPA Method 8270											
Acenaphthene	ug/kg	<330	<330	<330	<330	<330	6.2E+09	9.7E+07	8.1E+08	NA	
Anthracene	ug/kg	<330	<330	<330	<330	<330	2.9E+10	1.6E+09	1.0E+09	NA	
Benzo(a)anthracene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+05	NA	
Benzo(a)pyrene	ug/kg	<330	<330	<330	<330	<330	1.9E+06	NLV	2.1E+04	NA	
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	<330	<330	ID	ID	2.1E+05	NA	
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+06	NA	
Benzo(g, h, i)perylene	ug/kg	<330	<330	<330	<330	<330	3.5E+08	NLV	1.6E+07	NA	
Chrysene	ug/kg	<330	<330	<330	<330	<330	ID	ID	2.1E+07	NA	
Dibenzo(a, h)anthracene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+04	NA	
Dibenzofuran	ug/kg	<330	<330	<330	<330	<330	ID	ID	ID	NA	
Fluoranthene	ug/kg	<330	<330	<330	<330	<330	4.1E+09	8.8+08	5.4E+08	NA	
Fluorene	ug/kg	<330	<330	<330	<330	<330	4.1E+09	1.5E+08	5.4E+08	NA	
Indeno (1,2,3)pyrene	ug/kg	<330	<330	<330	<330	<330	ID	NLV	2.1E+05	NA	
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	<330	ID	ID	1.6E+08	NA	
Naphthalene	ug/kg	<330	<330	<330	<330	<330	1.5E+10	5.9E+07	1.6E+08	NA	
Phenanthrene	ug/kg	<330	<330	<330	<330	<330	5.9E+07	1.5E+05	1.6E+07	NA	
Pyrene	ug/kg	<330	<330	<330	<330	<330	2.9E+09	7.7E+08	3.4E+08	NA	
EPA Method 8260											
Cis-1,2-dichloroethene		SNA	SNA	SNA	SNA	SNA	2.3E+11	4.7E+07	6.5E+05	1.0E+06	
Trichloroethene		SNA	SNA	SNA	SNA	SNA	2.3E+09	2.6+05	5.0E+05	1.2E+06	

Notes:

ug/kg - micrograms per kilogram
NA - Not applicable
NLV - Not likely to volatilize
ID - Inadequate data to develop criterion
PSIC - Particulate Soil Inhalation Criteria
VSIC - Volatile Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration

SNA - Sample not analyzed for this compound
Samples collected March 1997

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE C-3
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification						Industrial Unlimited Land Use PSIC	Industrial Infinite Source VSIC	Generic Industrial Commercial Subcategory II Cleanup DCV	Generic Csat
		SB-P9-3-1 (6'-2')	SB-P9-3-1 (14-16')	SB-P9-3-2 (6'-2')	SB-P9-3-2 (4-6')	SB-P9-3-2 (10-12')					
<i>EPA Method 8270</i>											
Acenaphthene	ug/kg	<330	<330	<330	<330	SNA		6.2E+09	9.7E+07	8.1E+08	NA
Anthracene	ug/kg	<330	<330	<330	<330	SNA		2.9E+10	1.6E+09	1.0E+09	NA
Benzo(a)anthracene	ug/kg	<330	<330	<330	<330	SNA		ID	NLV	2.1E+05	NA
Benzo(a)pyrene	ug/kg	<330	<330	<330	<330	SNA		1.9E+06	NLV	2.1E+04	NA
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	<330	SNA		ID	ID	2.1E+05	NA
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	<330	SNA		ID	NLV	2.1E+06	NA
Benzo(g, h, i)perylene	ug/kg	<330	<330	<330	<330	SNA		3.5E+08	NLV	1.6E+07	NA
Chrysene	ug/kg	8,000	<330	<330	<330	SNA		ID	ID	2.1E+07	NA
Dibenz(a, h)anthracene	ug/kg	<330	<330	<330	<330	SNA		ID	NLV	2.1E+04	NA
Dibenzofuran	ug/kg	<330	<330	<330	<330	SNA		ID	ID	ID	NA
Fluoranthene	ug/kg	1,100	<330	<330	<330	SNA		4.1E+09	8.8+08	5.4E+08	NA
Fluorene	ug/kg	520	<330	<330	<330	SNA		4.1E+09	1.5E+08	5.4E+08	NA
Indeno (1,2,3)pyrene	ug/kg	<330	<330	<330	<330	SNA		ID	NLV	2.1E+05	NA
2-Methylnaphthalene	ug/kg	<330	<330	<330	<330	SNA		ID	ID	1.6E+08	NA
Naphthalene	ug/kg	<330	<330	<330	<330	SNA		1.5E+10	5.9E+07	1.6E+08	NA
Phenanthrene	ug/kg	2,600	<330	<330	<330	SNA		5.9E+07	1.5E+05	1.6E+07	NA
Pyrene	ug/kg	2,100	<330	<330	<330	SNA		2.9E+09	7.7E+08	3.4E+08	NA
<i>EPA Method 8260</i>											
Cis-1,2-dichloroethene	ug/kg	SNA	180	SNA	SNA	<10		2.3E+11	4.7E+07	6.5E+05	1.0E+06
Trichloroethene	ug/kg	SNA	670	SNA	SNA	<10		2.3E+09	2.6+05	5.0E+05	1.2E+06

Notes:

ug/kg - micrograms per kilogram
NA - Not applicable
NLV - Not likely to volatilize
ID - Inadequate data to develop criterion
PSIC - Particulate Soil Inhalation Criteria
VSIC - Volatile Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration

SNA - Sample not analyzed for this compound
Samples collected March 1997

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE C-3
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification					Industrial Unlimited Land Use PSIC	Industrial Infinite Source VSIC	Generic Industrial Commercial Subcategory II Cleanup DCV	Generic Csat
		SB-P9-4-1 (0-6")	SB-P9-4-1 (12-14')	SB-P9-4-2 (0-6")	SB-P9-4-2 (6-8')	SB-P9-5-1 (10-12')				
<i>EPA Method 8270</i>										
Acenaphthene	ug/kg	<330	<330	<330	3,200	<330	6.2E+09	9.7E+07	8.1E+08	NA
Anthracene	ug/kg	<330	<330	<330	1,300	<330	2.9E+10	1.6E+09	1.0E+09	NA
Benzo(a)anthracene	ug/kg	<330	<330	<330	3,300	<330	ID	NLV	2.1E+05	NA
Benzo(a)pyrene	ug/kg	<330	<330	<330	4,000	<330	1.9E+06	NLV	2.1E+04	NA
Benzo(b)fluoranthene	ug/kg	<330	<330	<330	4,000	<330	ID	ID	2.1E+05	NA
Benzo(k)fluoranthene	ug/kg	<330	<330	<330	2,800	<330	ID	NLV	2.1E+06	NA
Benzo(g, h, i)perylene	ug/kg	<330	<330	<330	3,400	<330	3.5E+08	NLV	1.6E+07	NA
Chrysene	ug/kg	980	3,500	<330	4,200	<330	ID	ID	2.1E+07	NA
Dibenzo(a, h)anthracene	ug/kg	<330	<330	<330	690	<330	ID	NLV	2.1E+04	NA
Dibenzofuran	ug/kg	<330	<330	<330	1,100	<330	ID	ID	ID	NA
Fluoranthene	ug/kg	<330	3,900	<330	7,200	<330	4.1E+09	8.8+08	5.4E+08	NA
Fluorene	ug/kg	800	6,300	<330	2,600	<330	4.1E+09	1.5E+08	5.4E+08	NA
Indeno (1,2,3)pyrene	ug/kg	<330	<330	<330	3,100	<330	ID	NLV	2.1E+05	NA
2-Methylnaphthalene	ug/kg	<330	4,100	<330	680	<330	ID	ID	1.6E+08	NA
Naphthalene	ug/kg	<330	3,200	<330	1,500	<330	1.5E+10	5.9E+07	1.6E+08	NA
Phenanthrene	ug/kg	2,200	23,000	<330	9,500	<330	5.9E+07	1.5E+05	1.6E+07	NA
Pyrene	ug/kg	450	5,800	<330	18,000	<330	2.9E+09	7.7E+08	3.4E+08	NA
<i>EPA Method 8260</i>										
Cis-1,2-dichloroethene	ug/kg	SNA	SNA	SNA	SNA	<10	2.3E+11	4.7E+07	6.5E+05	1.0E+06
Trichloroethene	ug/kg	SNA	SNA	SNA	SNA	<10	2.3E+09	2.6+05	5.0E+05	1.2E+06

Notes:

- ug/kg - micrograms per kilogram
 - NA - Not applicable
 - NLV - Not likely to volatilize
 - ID - Inadequate data to develop criterion
 - PSIC - Particulate Soil Inhalation Criteria
 - VSIC - Volatile Soil Inhalation Criteria
 - DCC - Direct Contact Criteria
 - Csat - Soil saturation screening concentration
- All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

SNA - Sample not analyzed for this compound
Samples collected March 1997

TABLE C-4
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

TABLE C-4
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units	Sample Identification							Industrial Unlimited Land Use PSIC	Industrial Infinite Source VSIC	Generic Industrial Commercial Subcategory II Cleanup DCC	Generic Csat
				SB-P9-1-1 (8-10')	SB-P9-2-3 (10-12')	SB-P9-3-1 (14-16')	SB-P9-4-1 (0-6")	SB-P9-4-1 (12-14')	SB-P9-4-2 (0-6")	SB-P9-4-2 (6-8')				
6020	Arsenic	0.10	mg/kg	3.1	5.8	12	4.7	8.5	8.8	1.3	910	NLV	100	NA
6020	Barium	1.0	mg/kg	13	37	89	30	40	41	6.6	5	NLV	320,000	NA
6020	Cadmium	0.05	mg/kg	BDL	0.14	0.3	0.16	0.11	0.16	BDL	2,200	NLV	2,300	NA
6020	Chromium *	0.20	mg/kg	5	13	28	7.4	14	19	4.3	330	NLV	22,000	NA
6020	Copper	1.0	mg/kg	3.8	9.1	19	7	10	11	2.4	59,000	NLV	170,000	NA
6020	Lead	1.0	mg/kg	2.8	6.2	13	4.7	7.2	10	1.7	44,000	NLV	900	NA
7471	Mercury	0.10	mg/kg	0.18	BDL	BDL	BDL	BDL	BDL	BDL	ID	NLV	1,400	NA
6020	Selenium	0.50	mg/kg	BDL	0.51	0.67	0.7	1	0.8	BDL	59,000	NLV	23,000	NA
6020	Silver	0.50	mg/kg	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2,900	NLV	21,000	NA
6020	Zinc	1.0	mg/kg	8.9	26	66	46	30	39	5.1	ID	NLV	1.0E+06	NA

Notes:
mg/kg - micrograms per kilogram
ID - Inadequate data to develop criterion
NA - Not applicable
NLV - Not likely to volatilize
BDL - below detection limit
Samples collected March 1997
PSIC - Particulate Soil Inhalation Criteria
VSIC - Volatile Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration
All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).
* - Criteria for hexavalent chromium used.

TABLE C-5
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Parameter Detected	Detection Level	Units		Sample Identification		GSI Values Applies to "Dissolved" Value	GCC Applies to "Total" Value	Water Solubility
					TW-P9-4-1 3/25/97	TW-P9-4-2 3/25/97			
200.8	Arsenic	1	ug/L	Total Dissolved*	22 BDL	22 20	150	4,700	NA
200.8	Barium	200	ug/L	Total Dissolved*	260 BDL	BDL BDL	200	1.5E+07	NA
200.8	Cadmium	0.2	ug/L	Total Dissolved*	1 BDL	2.4 1.9	4.6{A,D}**	110,000	NA
200.8	Chromium	5	ug/L	Total Dissolved*	110 6	16 24	165{A,D}	1.0E+06	NA
200.8	Copper	20	ug/L	Total Dissolved*	80 20	30 30	21{A,D}**	8.1E+06	NA
200.8	Lead	3	ug/L	Total Dissolved*	48 BDL	7 6	29**	ID	NA
245.1	Mercury	0.2	ug/L	Total Dissolved*	BDL BDL	0.4 BDL	0.2	>Solubility	56
200.8	Selenium	5	ug/L	Total Dissolved*	BDL BDL	6 9	5{A}	1.1E+06	NA
200.8	Zinc	20	ug/L	Total Dissolved*	200 40	150 140	270{A,D}**	1.2E+08	NA

Notes:

ug/L - micrograms per liter
NA - Not available
BDL - below detection limits
ID - Inadequate data to develop criterion
Bold values exceed GSI.
GSI - Groundwater Surface Water Interface
GCC - Groundwater Contact Criteria
{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria.
{D} - GSI value is pH, temperature, or water hardness dependent.
Samples collected March 1997.

* - Samples were field filtered with a 1-micron filter.

** - These values were calculated using a hardness of 265 for the Flint River, per Brenda Sayles, Surface Water Quality Division, 8/27/98.

TABLE C-6
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification							GSI Values	GCC	Water Solubility
		TW-P9-1-1 3/24/97	TW-P9-2-3 3/25/97	TW-P9-3-2 3/25/97	TW-P9-4-1 3/25/97	TW-P9-4-2 3/25/97	TW-P9-5-1 3/26/97	TW-P9-5-2 3/26/97			
<i>EPA Method 625</i>											
Acenaphthene	ug/L	<5	<5	<5	<5	180	<5	SNA	19	>Solubility	4,200
Anthracene	ug/L	<5	<5	<5	<5	100	<5	SNA	NA	>Solubility	43
Benzo(a)anthracene	ug/L	<5	<5	<5	<5	190	<5	SNA	NA	5	9.4
Benzo(b)fluoranthene	ug/L	<5	<5	<5	<5	190	<5	SNA	ID	5	1.5
Benzo(k)fluoranthene	ug/L	<5	<5	<5	<5	79	<5	SNA	NA	20	10.8
Benzo(a)pyrene	ug/L	<5	<5	<5	<5	160	<5	SNA	ID	5	1.6
Benzo(g,h,i)perylene	ug/L	<5	<5	<5	<5	110	<5	SNA	NA	ID	0.26
Chrysene	ug/L	<5	<5	<5	<5	210	<5	SNA	ID	5	1.6
Dibenzofuran	ug/L	<5	<5	<5	<5	70	<5	SNA	NA	ID	10,000
Fluoranthene	ug/L	<5	<5	<5	<5	430	<5	SNA	IP	>Solubility	210
Fluorene	ug/L	<5	<5	<5	<5	170	<5	SNA	NA	>Solubility	2,000
Indeno(1,2,3-cd)Pyrene	ug/L	<5	<5	<5	<5	110	<5	SNA	ID	5	0.022
2-Methylnaphthalene	ug/L	<5	<5	<5	<5	41	<5	SNA	ID	ID	25,000
Naphthalene	ug/L	<5	<5	<5	<5	74	<5	SNA	13	>Solubility	31,000
Phenanthrene	ug/L	<5	<5	<5	<5	580	<5	SNA	5	>Solubility	1,000
Pyrene	ug/L	<5	<5	<5	<5	780	<5	SNA	NA	>Solubility	140
<i>EPA Method 8260</i>											
Cis-1,2-dichloroethene	ug/L	SNA	SNA	120 *	SNA	SNA	SNA	1 *	ID	170,000	3.5E+06
Trans-1,2-dichloroethene	ug/L	SNA	SNA	7 *	SNA	SNA	SNA	<1.0 *	ID	200,000	6.3E+06
Trichloroethene	ug/L	SNA	SNA	71 *	SNA	SNA	SNA	<1.0 *	200	11,000	1.1E+06
Vinyl Chloride	ug/L	SNA	SNA	1 *	SNA	SNA	SNA	<1.0 *	15	290	2.8E+06

Notes:

ug/L - micrograms per liter
SNA - Sample not analyzed for this compound
ID - Inadequate data to develop criterion
IP - In process
NA - Not available
Bold values exceed GSI.
Italic values exceed GCC.
*collected in 1 liter amber bottle, data may not be reliable
GSI - Groundwater Surface Water Interface
GCC - Groundwater Contact Criteria

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE C-6
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification					GSI Values	GCC	Water Solubility
		MW-P9-3-3 10/23/97	MW-P9-5-4 10/23/97	MW-P9-5-5 10/23/97	P7-1 3/18/95	P7-2 3/18/95	P7-3 3/18/95		
<i>EPA Method 8260</i>									
1,1-Dichloroethane	ug/L	4	<1	<1	SNA	SNA	SNA	2.1E+06	5.1E+06
cis-1,2-Dichloroethene	ug/L	1,000	42	150	SNA	SNA	SNA	170,000	3.5E+06
Methyl-Tert-Butyl Ether	ug/L	120	<50	<50	SNA	SNA	SNA	5.8E+05	4.7E+07
Trichloroethene	ug/L	350	15	110	<1	<1	<1	11,000	1.1E+06
Vinyl Chloride	ug/L	190	<1	7	<1	<1	<1	290	2.8E+06

Notes:

ug/L - micrograms per liter

SNA - Sample not analyzed for this compound

ID - Inadequate data to develop criterion

NA - Not available

Bold values exceed GSI.

Italic values exceed GCC.

*collected in 1 liter amber bottle, data may not be reliable

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

**PART D - SUMMARY OF SUPPLEMENTAL INVESTIGATION
CONDUCTED BY SME**

1. SME Data Collection

Soil and Materials Engineers, inc. (SME) collected soil and groundwater samples from five areas at the former Building 9 Property for the future operation of the Asylum Substation - Consumers Energy. Three of the five areas included PAOCs that were previously identified and investigated by BBL. The other two areas were the former chrome plating area in the southwest corner of the site and an area in the southeast corner of the former Building 9 Property. The results of SME's investigation were supplied to GM on December 11, 1997 in the form of a data package. This package included a summary of sampling locations, figures, boring logs, and analytical reports prepared by SME's internal laboratory. Soil and groundwater samples were collected by SME from each area as follows:

- PAOC 1 Electrical Substation

Six soil samples were collected from soil boring locations SP-8, SP-17, and SP-18.

One groundwater sample was collected from each boring location utilizing direct push techniques.

- PAOC 4 Fire Protection Trench Excavation Area

Ten soil samples were collected from soil boring locations SP-13, SP-15, SP-16, SP-19, SP-20, and SP-21. A groundwater sample was collected from SP-13, SP-14, SP-16, SP-19, and SP-20 utilizing direct push techniques.

- PAOC 5 Former Degreasing Units

Twelve soil samples were collected from soil boring locations SP-4, SP-5, SP-6, SP-7/SB1, and SP-9. One groundwater sample was collected from each boring location utilizing direct push techniques.

- Southwest Corner/Formal Chrome Plating Area

Six soil samples were collected from soil boring locations SP-1, SP-2, and SP-3. A groundwater sample was collected from SP-1 and SP-3 utilizing direct push techniques.

- Southeast Corner

Five soil samples were collected from soil boring locations SP-10/SB3, SP-11, and SP-12. A groundwater sample was collected from each boring location utilizing direct push techniques.

A total of 39 soil samples were collected by SME at the former Building 9 Property and analyzed for the 10 Michigan metals, nickel, cyanide, VOCs, SVOCs, and PCBs. Eighteen groundwater samples were collected and analyzed for the 10 Michigan metals, nickel, cyanide, VOCs, SVOCs, and PCBs. Analytical results for organic and metals constituents in soil and groundwater are summarized by each area in Tables D-1 through D-18. In addition, tables for PAOCs 1, 4, and 5 also include the analytical results of soil and groundwater samples collected by BBL during the Phase II ESI activities.

**Part D - Summary of Supplemental Investigation
Conducted by SME**

*Privileged & Confidential
Prepared at Request of General Motors Counsel*

Analytical data presented by SME was validated by EAM (Appendix C) based on USEPA Laboratory Data Validation Functional Guidelines (December, 1994). It was determined that the data, except for cyanide results, did not satisfy the guidelines for quantitative interpretation. In general, spike and spike duplicates required to generate accuracy and precision data for analytical methods were not performed. Consequently, method performance could not be verified and all affected data should be flagged with a "J" which means that the results are valid for qualitative purposes only, and the concentrations reported may not be reliable for quantitative purposes. Data validation was performed on the SME data by Environmental and Analytical Management, Inc. (EAM) In January 1998. The EAM report is provided as Appendix A.

2. Summary of SME Results

2.1 Overview

This section summarizes the results of field screening and laboratory analyses.

2.2 Criteria Used by SME to Evaluate Data

Current and future land use at Flint West fits the generic criteria established for the industrial and commercial subcategory II, III, and IV exposure scenarios; however, the package SME prepared and supplied to GM contained summary tables that compared the analytical results for constituents in soil and groundwater to criteria based on a residential exposure scenario. The residential exposure scenario was used for all exposure pathways, regardless of relevance, in order to determine if the site is a "facility" as defined in Section 20101(1)(o) of PA 451. Analytical results for organic and metal constituents in groundwater samples were compared to the Health-based Drinking Water Values (HB DWVs) provided in OM#8. It was noted that the following incorrect data comparisons by SME for a generic residential scenario existed in the tables:

- Section 20120a.(2) states that the MDEQ shall utilize only reasonable and relevant exposure pathways in determining the adequacy of site specific criteria. SME did not use relevant pathways at this parcel.
- Review of material supplied to GM by Consumers Energy (CE) indicates that metal constituents in individual soil samples were compared to the MDEQ Default Criteria taken from OM # 15: Type A Cleanup Criteria dated September 30, 1993; however, Type A Default Values were established by MDEQ to facilitate cleanup at sites where naturally occurring metals are of concern. The generic residential DCVs outlined in OM #8 Revision 4 are the appropriate comparison criteria for metals in soil for a residential exposure scenario.
- Organic constituents in soil were compared to MDEQ 20 times the DWV. OM#8 states that these values have been provided for convenience and are not mandatory if other methods which better represent in situ conditions support the use of a higher value. Collection of groundwater samples in the same location as soil samples is a better method of evaluating groundwater impacts from soil. In addition, for those constituents that strongly adsorb to soil and are known not to leach at significant concentrations (PCBs, carcinogenic polynuclear aromatic hydrocarbons, and some chlorinated pesticides), direct contact values are accepted as the soil cleanup criteria to protect groundwater in addition to the direct contact hazards. Therefore the generic residential DCVs outlined in OM #8 Revision 4 are the appropriate comparison criteria for non-leaching organic constituents in soil for a residential exposure scenario and in areas where groundwater samples were collected concurrently with soil samples.
- SME compared groundwater concentrations to HB DWVs, but since the water bearing unit present at the site is not an aquifer as discussed previously and later in Part D, HB DWVs are not applicable.
- Statistical analysis of sample data is allowed under Part 201 and should be conducted to determine if positive detections are indeed statistically significant and exceed respective criteria.

2.3 Applicable Regulatory Standards Evaluated by BBL

Originally, BBL used the generic industrial and commercial cleanup criteria contained in the OM#14 Revision 2 as well as all Technical Support Documents to appropriately characterize the property based on maintaining industrial/commercial subcategory II, III, or IV land use. Current and expected land use at Flint West fits the generic criteria established for the industrial and commercial subcategory II exposure scenario, contained in OM#14; therefore, generic industrial criteria were used to evaluate analytical data from samples collected at the property in order to determine if unacceptable risk to human health and the environment exists at the site. As a standard practice relevant exposure pathways were evaluated in order to determine relevant criteria.

BBL concluded that if constituent concentrations were below relevant industrial/commercial subcategory II criteria at areas investigated, then no further investigation or response activities were warranted in the area where the sample was collected. If concentrations were above relevant generic criteria, then further investigation was required to determine the nature and extent of contaminants above relevant generic industrial/commercial subcategory II criteria.

2.3.1 Potential Exposure Pathways for Soil Evaluated by BBL

Exposure pathways to be considered for soil include direct contact (dermal and ingestion), inhalation of fugitive dust, inhalation of volatile emissions, surface runoff and erosion, inhalation of particulates from soil in the upper six-inches of the soil column, and migration to groundwater.

Mobilization to potable groundwater is also a potential ingestion pathway for soil contamination, but because groundwater quality was directly evaluated by analysis of groundwater samples collected in each area where soils were sampled, comparison of soil data to SWP criteria was not necessary. Further, as discussed in the following text, groundwater in the surficial unit is not an "aquifer" as defined in the administrative rules of Part 201; therefore, soil protective-of-groundwater criteria are not applicable at this Site in locations where groundwater samples were collected. Soil protective-of-surface water criteria exceedences may be applicable, if groundwater samples were not collected concurrently in the same sampling locations as the soil samples.

Although the site is covered with concrete and asphalt and inhalation of fugitive dust may not be a complete exposure pathway, soil data have been compared to VSIC and PSIC.

Exposure of Site workers to soil impacts by dermal contact is a potentially complete pathway. Soil concentrations at the Property were compared to DCVs.

2.3.2 Potential Exposure Pathways for Groundwater Evaluated by BBL

The State of Michigan Act 451 Part 201 Administrative Rules (R299.5101(c)) and the Code of Federal Regulation (CFR, Part 40, Section 149.2) define an aquifer as "... a geological formation, group of formations, or part (portion) of a formation that is capable of yielding a significant amount of ground water to wells or springs." The thin surficial water bearing unit at the site has a very low transmissivity (10^{-4} to 10^{-5} cm/sec) and does not meet the definition of an aquifer for the following reasons:

1. The unit does not yield enough water for it to be considered an economically viable water source; and,

2. The natural water quality of the surficial water-bearing unit is highly mineralized and is such that extensive treatment would be required prior to use.

The practical definition of an aquifer is further clarified in the book *Groundwater and Wells* as "a saturated bed, formation, or group of formations which yields water in sufficient quantity to be economically useful (Driscoll, 1986)." From an economical standpoint, wells that yield less than approximately 2 gpm are not useful as water supply. Site-specific data collected from the Flint West facility was input into the Cooper-Jacob equation to estimate sustainable flow from the surficial water-bearing unit, as follows:

$$Q = \frac{s T}{264 \log 0.3 \frac{Tt}{r^2 S}}$$

Where Q = pumping rate, gpm
T = transmissivity, gpd/ft = K*b
K = conductivity, gpd/ft² = 4.2
(site data, BBL, June 1997)
s = drawdown, feet = 5
r = distance from pumping well, feet = 5
t = time since pumping started, days = 365
b = saturated thickness, feet = 5
S = storage coefficient, dimension less = 0.15

$$Q = \frac{5 \times 21}{264 \log 0.3 \left(\frac{21 \times 365}{5^2 \times 0.15} \right)} = 0.14 \text{ gpm}$$

This projection was verified by data from short-term pumping at monitoring wells installed for LUST investigation at the nearby Building 2A (ES&E, January 8, 1992). Results of a step drawdown test indicated that 1 gpm was the maximum sustainable pumping rate for the pump test. This information further supports the determination that the surficial water-bearing unit cannot be considered an aquifer.

A review of well completion records from Genesee County indicated that potable wells in the area are open to the Saginaw sandstone below the glacial deposits.

In addition, and as added emphasis, there are several institutional reasons that this water unit could not be used as a potable aquifer, namely:

1. Other much more productive and economically viable aquifer sources are readily available in the area;
2. The surficial medium-to-fine grained sand unit is highly variable in thickness, and is not thick enough to support the amount of casing required by the State of Michigan Department of Health for public potable water supply wells (25 feet) throughout much of the Flint West property. State regulations (Michigan Drinking Water Regulations, R 325.10818) require that casings for potable water supply wells extend at least 25 feet bls.;

3. The Genesee County Health Department will not issue permits for public potable water supply wells within the Flint City limits; and,
4. Potable water is readily available throughout the Flint area from the municipal utility and hookup is mandatory.

Representatives of the Genesee County Health Department (personal communication) stated there were no public potable water supply wells drilled to tap the glacial drift since 1967, when records were first required. Personnel from the City of Flint Water Services stated that hookup to the municipal water supply is mandatory within City limits (Flint City Code, Section 46-25).

Based on groundwater elevation data collected on July 20, 1996 (after one week of little or no precipitation) and August 4, 1996 (within 24 hours after a 48 hour rain event) groundwater flows primarily towards the Flint River [O'Brien & Gere (OBG), 1996]. This data concurs with additional file reports on the surrounding area, that documented a groundwater flow direction towards the Flint River. The water table in the area lies approximately 4 to 16-feet bls, depending on the distance from the Flint River.

Accordingly, the surficial unit is not an aquifer, the ingestion pathway is not complete and health-based and aesthetic drinking water criteria are not applicable to Site groundwater. Exposure pathways to be considered for groundwater include direct contact (dermal and ingestion) and discharge to surface water.

Dermal contact with groundwater by utility workers has been considered; therefore, groundwater results were compared to the utility worker GCC published by MDEQ.

Groundwater venting to surface water is a viable pathway to consider for groundwater. If the groundwater samples collected on-site contain contaminant concentrations above GSI criteria, additional groundwater samples were collected from monitoring wells closer to or adjacent to the Flint River to determine if concentrations exceed GSI values.

2.4 Discussion of SME Laboratory Analytical Data in Conjunction with BBL Laboratory Analytical Data

Data collected during the ESI (Part C of this report) and by SME were compared to all relevant and irrelevant criteria for a residential exposure scenario to determine if the Site is considered a "facility" under Part 201. Under a residential exposure scenario the analytical results for constituents in soil and groundwater were compared to applicable regulatory criteria, as follows:

- Analytical results for constituents in soil were compared to Generic Residential DCVs provided in OM #8 Revision 4, Residential VSICs and PSICs from the MDEQ "Interim Generic Soil Inhalation Criteria to Ambient Air", and Generic Soil Saturation values from MDEQ "Generic Soil Saturation Screening Concentrations."
- Analytical results for constituents in groundwater were compared to GSI criteria outlined in the MDEQ "New GSI Cleanup Criteria - Addendum to OM #8 Revision 4 and OM #14 Revision 2" and GCC and water solubility values from the MDEQ "Generic Groundwater Contact Criteria: Technical Support Document".

**Part D - Summary of Supplemental Investigation
Conducted by SME**

*Privileged & Confidential
Prepared at Request of General Motors Counsel*

As a first screen, BBL compared the data from each sampling location to the above-listed applicable regulatory criteria for a residential exposure scenario. The data comparison is shown in Table D-19 for constituents that exceed the regulatory criteria at an individual sampling location. A statistical analysis was then conducted to determine if the 95% Upper Confidence Limit (UCL) of the median concentration of each constituent at all sampling locations at the entire site exceeded the relevant generic criteria.

3. Conclusions and Recommendations Based on SME Data

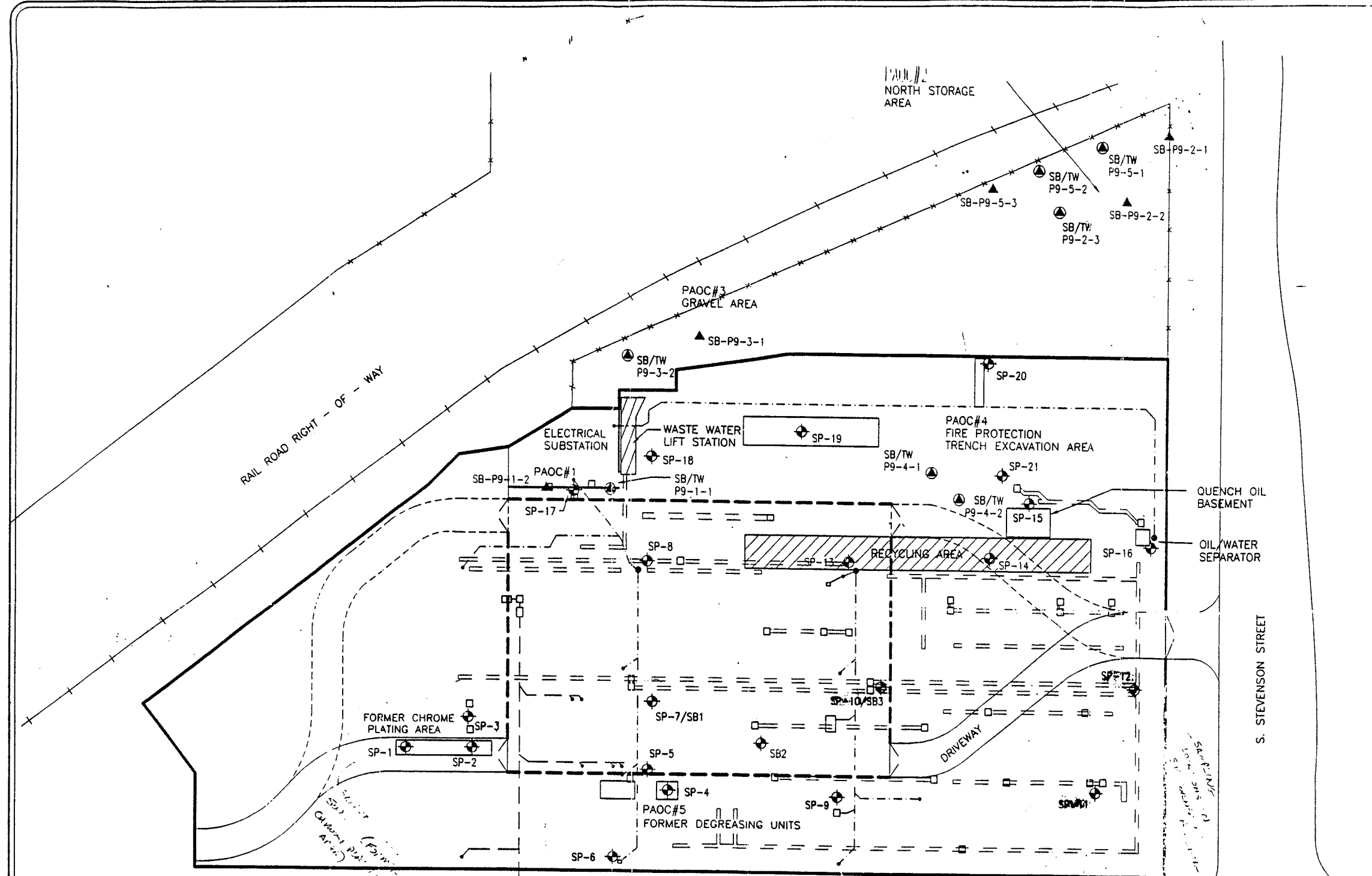
Based on the residential exposure scenario, the analytical data summarized in Table D-19 indicates individual sampling location concentrations that exceeded the DCVs in soil and the GSI values and GCC in groundwater. BBL performed a statistical analysis to determine if the 95% UCL of the median exceeds the referenced criteria. The statistical approach and results are provided in Part E.

Although VOCs and SVOCs in groundwater were detected above the GSI criteria, analytical data from down gradient monitoring wells P7-1 and P7-2 (associated with the former USTs 14 and 15 at Building 7) indicate that SVOCs and VOCs were below detection limits in the groundwater in a compliance point between the parcel and the surface water body. Consequently, the groundwater venting to surface water does not exceed GSI criteria for SVOC and VOCs. Therefore, this does not constitute determination that the Site is a "facility" due to exceedences of GSI criteria.

Laboratory analysis of groundwater samples contained barium, copper, lead, mercury, selenium, zinc, and cyanide at concentrations above the GSI criteria. However, as discussed in Part E, the 95% UCL of the median concentrations of these metals are below the GSI criteria, with the exception barium. Although the 95% UCL on the median barium concentration (270 ug/L) exceeds the GSI criteria (190 ug/L), the Building 9 property is over 500 feet from the GSI. It is expected that by the time groundwater reaches the GSI, the barium concentrations are below the GSI criteria. This can be confirmed with groundwater sampling. Based on the statistical analysis and expected dispersion of barium by the time the groundwater reaches the GSI, the metals concentrations detected in groundwater do not indicate that the Site is a "facility" due to exceedences of GSI criteria. The 95% UCL calculations are included in Part E.

In addition, pursuant to Section 20107a and because the parcel is not a 'facility', there are no known conditions at the parcel that will require the exercise of due care by undertaking a response activity to mitigate unacceptable exposure to levels of hazardous substances present in soils and groundwater. In the case that contamination is discovered that determines the parcel or portions of the parcel are considered a facility that there was no evidence of during the previously appropriate inquiries, the due care responsibilities must be complied with as defined in Section 20107a.

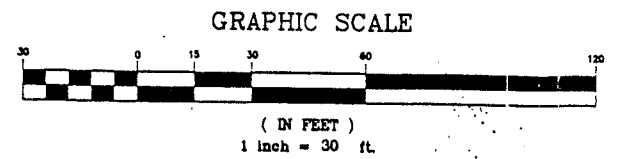
PART D - FIGURES



LEGEND

- SP-7/SB1 SOIL BORING LOCATION
- SP-1 SOIL PROBE LOCATION
- PAOC#1 POTENTIAL AREA OF CONCERN IDENTIFIED IN BBL PHASE 1 ESA REPORT (JUNE, 1997)
- FORMER PROCESS TRENCHES
- FORMER BUILDING 9 FOOTPRINT
- PROPOSED ASYLUM SUBSTATION
- PREVIOUS SOIL BORING LOCATION
- PREVIOUS TEMPORARY WELL LOCATION

- SANITARY SEWER
- STORM SEWER
- PIT OR TRENCH
- CATCH BASIN



Drawing Record

DRAWN: MBA
DATE: 11-12-97
SCALE: 1" = 30'

CHECKED BY: PLS/LMH
DATE: 11-12-97

Project Title

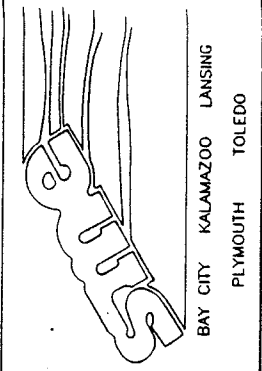
SOIL PROBE AND SOIL BORING LOCATION DIAGRAM
PROPOSED ASYLUM SUBSTATION
BUILDING 9 DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Project Record

JOB: PE 28979
FILE: H:28979
PLOT
DATE: 09-26-97

Sheet No.

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OF 1



PART D - TABLES

TABLE D-1
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL - PAOC #1
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Detection Level	Sample Identification										Residential Infinite Source VSIC	Residential Unlimited Land Use PSIC	Generic Csat	Generic Residential Cleanup DCV	
			SB-P9-1-1 (0-6")	SB-P9-1-1 (8-10")	SB-P9-1-2 (0-6")	SB-P9-1-2 (14-16")	SP-8* (5-7")	SP-8* (14-16")	SP-17* (4-6")	SP-17* (12-14")	SP-18* (14-16")	SP-18* (22-24")					
EPA Method 8270																	
Anthracene	ug/kg	330	BDL	BDL	BDL	BDL	390 J	BDL	560 J	1,100 J	BDL	BDL	1.4E+09 NLV	6.7E+10 ID	NA	4.2E+08	
Benzo(a)anthracene	ug/kg	330	BDL	BDL	BDL	BDL	360 J	BDL	BDL	BDL	BDL	BDL	ID	ID	NA	1.4E+04	
Chrysene	ug/kg	330	BDL	BDL	BDL	BDL	340 J	BDL	BDL	BDL	BDL	BDL	ID	ID	NA	1.4E+06	
Fluoranthene	ug/kg	330	BDL	BDL	BDL	BDL	860 J	BDL	340 J	620 J	BDL	BDL	7.4E+08 ID	9.3E+09	NA	5.1E+07	
Phenanthrene	ug/kg	330	BDL	BDL	BDL	BDL	690 J	BDL	890 J	930 J	BDL	BDL	1.3E+05	1.3E+08	NA	1.5E+06	
Pyrene	ug/kg	330	BDL	BDL	BDL	BDL	760 J	BDL	590 J	730 J	BDL	BDL	6.5E+08 NLV	6.7E+09	NA	3.2E+07	
Di-n-octyl phthalate	ug/kg	330	BDL	BDL	BDL	BDL	350 J	BDL	BDL	610 J	BDL	BDL		ID	1.4E+08	7.6E+06	
EPA Method 8260																	
Cis-1,2-dichloroethene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	10 J	BDL	BDL	52 J	4.0E+07	5.3E+11	6.4E+05	6.4E+05	
Trichloroethene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	22 J	BDL	BDL	820 J	7.8E+04	1.8E+09	5.0E+05	1.6E+05	
Benzene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	49 J	BDL	BDL	BDL	1.3E+04	3.8E+08	4.0E+05	8.8E+04	
Toluene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	50 J	BDL	BDL	BDL	2.8E+06	2.7E+10	2.5E+05	2.5E+05	
Ethylbenzene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	34 J	BDL	BDL	BDL	9.5E+06	6.7E+10	1.4E+05	1.4E+05	
Xylenes	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	108 J	BDL	BDL	BDL	4.6E+07	2.9E+11	1.5E+05	1.5E+05	

Notes:
ug/kg - micrograms per kilogram
BDL - Below detection limit
NA - Not available
J - Indicates estimated value; appropriate for qualitative purposes only.
ID - Inadequate data to develop a criterion
SNA - Sample not analyzed for this compound
VSIC - Volatile Soil Inhalation Criteria
PSIC - Particulate Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration
Samples collected in March 1997 (BBL).

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).
Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.
All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-2
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL - PAOC #1
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method Used By BBL	EPA Method Used By SME	Parameter Detected	Units	Detection Level	Sample Identification							Generic Residential Cleanup DCV	Residential Unlimited Land Use PSIC
					SB-P9-1-1 (8-10')	SP-8* (5-7')	SP-8* (14-16')	SP-17* (4-6')	SP-17* (12-14')	SP-18* (14-16')	SP-18* (22-24')		
6020	7061	Arsenic	mg/kg	0.1	3.1	4.1 J	3.8 J	5.7 J	3.4 J	3.9 J	3 J	6.6	720
6020	7081	Barium	mg/kg	1	13	29 J	45 J	62 J	25 J	24 J	23 J	30,000	330,000
6020	7131	Cadmium	mg/kg	0.05	BDL	0.084 J	0.076 J	0.24 J	0.065 J	0.14 J	0.06 J	2,100	1,700
6020	7191	Chromium	mg/kg	0.2**	5	11 J	8.3 J	16 J	11 J	19 J	6 J	2,000	2,600
6020	7211	Copper	mg/kg	1	3.8	6.9 J	5.2 J	21 J	17 J	11 J	3.7 J	16,000	130,000
6020	7421	Lead	mg/kg	1	2.8	11 J	6.1 J	41 J	3.3 J	13 J	3.5 J	900	100,000
7471	7470	Mercury	mg/kg	0.1	0.18	BDL	BDL	BDL	BDL	BDL	BDL	32,000	13,000
NA	7520	Nickel	mg/kg	1	SNA	15 J	12 J	26 J	16 J	24 J	6.3 J	2,100	130,000
6020	7950	Zinc	mg/kg	1	8.9	23 J	23 J	120 J	25 J	49 J	14 J	140,000	ID

Notes:

mg/kg - micrograms per kilogram

BDL - Below detection limit

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

SNA - Sample not analyzed for this compound

DCC - Direct Contact Criteria

PSIC - Particulate Soil Inhalation Criteria

Samples collected in March 1997 (BBL)

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - The detection level for samples analyzed for chromium by SME was 2.5 mg/kg.

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL. Results for selenium, silver, and cyanide were BDL for the above-listed samples and therefore not presented in this table.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-3
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER - PAOC #1
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Detection Level	Parameter Detected	Units	Sample Identification			Health Based DWV	GSI Values	GCC	Water Solubility
				SP-8* (16-18')	SP-17* (14-16')	SP-18* (17-19')				
7081	200	Barium	ug/L	380 J	250 J	390 J	2,000 {A,C}	200	1.5E+07	NA
7131	0.5	Cadmium	ug/L	BDL	BDL	1.4 J	5 {A,C}	4.6 {A,D}**	1.1E+05	NA
7421	3	Lead	ug/L	BDL	BDL	7 J	4 {A,L}	29**	ID	NA
9010A	200	Cyanide	ug/L	BDL	29	BDL	200 {C}	200{M}	6.5E+05	NA

Notes:

ug/L - micrograms per liter

BDL - Below detection limit

NA - Not available

ID - Inadequate data to develop a criteria

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

DWV - Drinking water value

{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria.

{C} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

{D} - GSI value is pH, temperature, or water hardness dependent.

{L} - Criteria developed using U.S. EPA Integrated Uptake Biokinetic Model for children. No risk assessment method(s) is currently available to evaluate lead toxicity in adults.

{M} - Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off site will not impact adjacent properties.

{J} - Calculated criterion is below the analytical method detection limit (MDL), therefore the criterion defaults to the MDL.

J - Indicates estimated value; appropriate for qualitative purposes only.

Italic values exceed GSI.

Bold values exceed the Health-Based DWV.

Only metals detected above the detection level are presented in this table; metals not listed were BDL.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - These values were calculated using a hardness of 265 for the Flint River, per Brenda Sayles, Surface Water Quality Division 8/27/98.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-4
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER - PAOC #1
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification			Residential Health Based DWC	GSI Values	GCC	Water Solubility
		SP-8* (16-18')	SP-17* (14-16')	SP-18* (17-19')				
<i>EPA Method 8260</i>								
Cis-1,2-dichloroethene	ug/L	190 J	4 J	110 J	70 {A}	ID	1.7E+05	3.5E+06
1,1,1-Trichloroethane	ug/L	BDL	BDL	77 J	200 {A}	200	3.8E+05	1.3E+06
Trichloroethene	ug/L	250 J	6 J	180 J	5 {A}	200	11,000	1.1E+06

Notes:

ug/L - micrograms per liter
BDL - Below detection limit

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

DWC - Drinking water criteria

ID - Inadequate data to develop a criteria

{A} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

J - Indicates estimated value; appropriate for qualitative purposes only.

Italic values exceed GSI.

Bold values exceed the Health-Based DWC.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

Only constituents detected above the detection level are presented in this table; constituents not listed were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-5
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL - PAOC #4
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Detection Level	Sample Identification																Residential Infinite Source	Residential Unlimited Land Use	Generic Residential Cleanup	Generic Csat
			SB-P9-4-1 (0-6")	SB-P9-4-1 (12-14")	SB-P9-4-1 (0-6")	SB-P9-4-2 (6-8")	SB-P9-4-2 (2-4")	SP-13* (12-14")	SP-13* (5-7)	SP-15* (6-8)	SP-16* (10-12)	SP-16* (2-4)	SP-19* (7-9)	SP-20* (5-7)	SP-20* (11-13)	SP-21* (6-8)						
EPA Method 8270																						
Acenaphthene	ug/kg	330	BDL	BDL	BDL	3,200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	8.1E+07	1.4E+10	7.6E+07	NA		
Anthracene	ug/kg	330	BDL	BDL	BDL	1,300	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.4E+09	6.7E+10	4.2E+08	NA		
Benzo(a)anthracene	ug/kg	330	BDL	BDL	BDL	3,300	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	14,000	NA		
Benzo(a)pyrene	ug/kg	330	BDL	BDL	BDL	4,000	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	1,400	NA		
Benzo(b)fluoranthene	ug/kg	330	BDL	BDL	BDL	2,800	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ID	1.5E+06	14,000	NA		
Benzo(k)fluoranthene	ug/kg	330	BDL	BDL	BDL	3,400	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	1.4E+05	NA		
Benzo(g,h,i)perylene	ug/kg	330	BDL	BDL	BDL	3,400	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	1.5E+06	NA		
Chrysene	ug/kg	330	980	3,500	BDL	4,200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ID	ID	1.4E+06	NA		
Dibenz(a,h)anthracene	ug/kg	330	BDL	BDL	BDL	680	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	1,400	NA		
Dibenzofuran	ug/kg	330	BDL	BDL	BDL	1,100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ID	ID	ID	NA		
Fluoranthene	ug/kg	330	BDL	3,900	BDL	7,200	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.4E+08	9.3E+09	5.1E+07	NA		
Fluorene	ug/kg	330	800	6,300	BDL	2,600	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.3E+08	9.3E+09	5.1E+07	NA		
Indeno(1,2,3-cd)pyrene	ug/kg	330	BDL	BDL	BDL	3,100	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	14,000	NA		
2-Methylnaphthalene	ug/kg	330	BDL	4,100	BDL	680	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ID	ID	1.5E+07	NA		
Naphthalene	ug/kg	330	BDL	3,200	BDL	1,500	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.9E+07	3.3E+10	1.5E+07	NA		
Phenanthrene	ug/kg	330	2,200	23,000	BDL	9,500	360 J	690 J	BDL	790 J	670 J	940 J	670 J	BDL	BDL	BDL	1.3E+05	1.3E+08	1.5E+07	NA		
Pyrene	ug/kg	330	450	5,800	BDL	18,000	690 J	1,400 J	BDL	810 J	480 J	730 J	480 J	BDL	BDL	BDL	6.5E+08	6.7E+09	3.2E+07	NA		
Di-n-octyl phthalate	ug/kg	330	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	ID	7.6E+06	1.4E+08		
Butyl benzyl phthalate	ug/kg	330	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	NLV	4.7E+10	3.1E+05	3.1E+05		
EPA Method 8260																						
Cis-1,2-dichloroethene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	19 J	190 J	11 J	BDL	BDL	BDL	BDL	4.0E+07	5.3E+11	6.4E+05	6.4E+05		
Trichloroethene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	13 J	30 J	31 J	BDL	BDL	BDL	BDL	7.8E+04	1.8E+09	1.6E+05	5.0E+05		
Benzene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	BDL	BDL	19 J	BDL	BDL	BDL	BDL	1.3E+04	3.8E+08	8.8E+04	4.0E+05		
Toluene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.8E+06	2.7E+10	2.5E+05	2.5E+05		
Ethylbenzene	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	BDL	BDL	20 J	BDL	BDL	BDL	BDL	9.5E+06	6.7E+10	1.4E+05	1.4E+05		
Xylenes	ug/kg	10	SNA	SNA	SNA	SNA	BDL	BDL	BDL	BDL	BDL	63 J	BDL	BDL	BDL	BDL	4.6E+07	2.9E+11	1.5E+05	1.5E+05		

Notes:
ug/kg - micrograms per kilogram
BDL - Below detection limit
NA - Not available
J - Indicates estimated value; appropriate for qualitative purposes only.
ID - Inadequate data to develop a criterion
SNA - Sample not analyzed for this compound
VSIC - Volatile Soil Inhalation Criteria
PSIC - Particulate Soil Inhalation Criteria
DCC - Direct Contact Criteria
Csat - Soil saturation screening concentration
Samples collected in March 1997 (BBL).
* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).
Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.
Bold values exceed DCV.
All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-6
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL - PAOC #4
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method Used By BBL	EPA Method Used By SME	Parameter Detected	Units	Detection Level	Sample Identification															Generic Residential Cleanup DCV	Residential Unlimited Land Use PSIC
					SB-P9-4-1 (0-6")	SB-P9-4-1 (12-14")	SB-P9-4-2 (0-6")	SB-P9-4-2 (6-8")	SP-13* (2-4")	SP-13* (12-14")	SP-15* (5-7)	SP-16* (6-8")	SP-16* (10-12)	SP-19* (2-4")	SP-19* (7-9")	SP-20* (5-7)	SP-20* (11-13")	SP-21* (6-8")			
6020	7061	Arsenic	mg/kg	0.1	4.7	8.5	8.8	1.3	3.7 J	3.1 J	42 J	6.1 J	2.7 J	3.7 J	4.7 J	4.9 J	2.4 J	5.1 J	6.6	720	
6020	7081	Barium	mg/kg	1	30	40	41	6.6	54 J	46 J	450 J	62 J	37 J	34 J	39 J	35 J	38 J	20 J	30,000	330,000	
6020	7131	Cadmium	mg/kg	0.05	0.16	0.11	0.16	BDL	0.093 J	0.11 J	0.38 J	0.088 J	0.075 J	0.15 J	0.12 J	0.13 J	0.054 J	0.1 J	2,100	1,700	
6020	7191	Chromium	mg/kg	0.2**	7.4	14	19	4.3	10 J	9.5 J	55 J	16 J	10 J	22 J	12 J	11 J	4.3 J	12 J	2,000	2,600	
6020	7211	Copper	mg/kg	1	7	10	11	2.4	7.2 J	6.4 J	65 J	16 J	7.2 J	7.7 J	12 J	11 J	3.6 J	12 J	16,000	130,000	
6020	7421	Lead	mg/kg	1	4.7	7.2	10	1.7	13 J	13 J	55 J	14 J	7.7 J	14 J	11 J	13 J	4.4 J	25 J	900	100,000	
NA	7520	Nickel	mg/kg	1	BDL	BDL	BDL	BDL	13 J	13 J	43 J	21 J	11 J	17 J	17 J	17 J	5.1 J	19 J	32,000	13,000	
6020	7741	Selenium	mg/kg	0.5	0.7	1	0.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2,100	130,000	
6020	7950	Zinc	mg/kg	1	46	30	39	5.1	35 J	44 J	43 J	39 J	23 J	30 J	34 J	32 J	13 J	42 J	140,000	ID	

Notes:

mg/kg - milligrams per kilogram

BDL - Below detection limit

NA - Not available

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

SNA - Sample not analyzed for this compound

DCC - Direct Contact Criteria

PSIC - Particulate Soil Inhalation Criteria

Samples collected in March 1997 (BBL)

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME)

** - The detection level for samples analyzed for chromium by SME was 2.5 mg/kg.

Results for selenium, silver, and cyanide were BDL for the above-listed samples and therefore not presented in the this table.

Bold values exceed the Residential DCV.

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-7
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER - PAOC #4
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method/ BBL	Detection Level/ BBL	EPA Method/ SME	Detection Level/ SME	Parameter Detected	Units		Sample Identification							Residential Health Based DWV	GSI Values	GCC	Water Solubility
							TW-P9-4-1 3/25/97	TW-P9-4-2 3/25/97	SP-13* (13-15)	SP-14* (17)	SP-16* (16-18)	SP-19* (16-18)	SP-20* (16-18)				
200.8	1	7061	5	Arsenic	ug/L	Total Dissolved	22 BDL	22 BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	50 {A,C}	150	4,700	NA
200.8	200	7081	200	Barium	ug/L	Total Dissolved	260 BDL	BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	2,000 {A,C}	200	1.5E+07	NA
200.8	0.2	7131	0.5	Cadmium	ug/L	Total Dissolved	1 BDL	2.4 BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	5 {A,C}	4.6 {A,D}**	1.1E+05	NA
200.8	5	7191	50	Chromium	ug/L	Total Dissolved	110 6	16 24	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	100 {A,C,J}	165{A,D}	1.0E+06	NA
200.8	20	7211	25	Copper	ug/L	Total Dissolved	80 20	30 30	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	1,000	21{A,D}*	8.1E+06	NA
200.8	3	7421	3	Lead	ug/L	Total Dissolved	48 BDL	7 BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	4 {A,L}	29**	ID	NA
245.1	0.2	7470	0.2	Mercury	ug/L	Total Dissolved	BDL	0.4 BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	2 {A,C}	0.2 {M}	>Solubility	56
200.8	5	7741	5	Selenium	ug/L	Total Dissolved	BDL	6 BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	50 {A,C}	5{A}	1.1E+06	NA
200.8	20	7950	20	Zinc	ug/L	Total Dissolved	200 40	150 140	SNA BDL	SNA BDL	SNA BDL	SNA BDL	SNA BDL	2,400 {A}	270{A,D}	1.2E+08	NA
NA	NA	9010A	200	Cyanide	ug/L	Total	SNA	SNA	160 470	BDL	BDL	BDL	BDL	200 {C}	20	6.5E5**	NA

Notes:

ug/L - micrograms per liter
BDL - Below detection limit
SNA - Sample not analyzed for this constituent
NA - Not available
ID - Inadequate data to develop a criteria
GSI - Groundwater Surface Water Interface
GCC - Groundwater Contact Criteria
DWV - Drinking water value

{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria

{C} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

{D} - GSI value is pH, temperature, or water hardness dependent

{J} - Chemical may be present in several isomer forms. Isomer specific concentrations must be combined for comparison to criteria.

{L} - Criteria developed using U.S. EPA Integrated Uptake Biokinetic Model for children. No risk assessment method(s) is currently available to evaluate lead toxicity in adults.

Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off site will not impact adjacent properties.

J - Indicates estimated value; appropriate for qualitative purposes only.

Italic values exceed GSI.

Bold values exceed the Health-Based DWV.

Only metals detected above the detection level are presented in this table; metals not listed were BDL.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - These values were calculated using a hardness of 265 for the Flint River, per Brenda Sayles, Surface Water Quality Division, 8/27/98.

Samples collected March 1997 (BBL).

BBL samples were field filtered using a 1-micron filter.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-8
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER - PAOC #4
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Detection Level	Sample Identification							Health Based DWV	GSI	GCC	Water Solubility
			TW-P9-4-1 3/25/97	TW-P9-4-2 3/25/97	SP-13* (13-15)	SP-14* (17)	SP-16* (16-18)	SP-19* (16-18)	SP-20* (16-18)				
EPA Method 825 (BBL/8270 (SME))													
Acenaphthene	ug/L	5	BDL	180	BDL	BDL	BDL	BDL	BDL	1,300	19	>Solubility	4,240
Anthracene	ug/L	5	BDL	100	5 J	18 J	BDL	BDL	BDL	7,300	NA	>Solubility	43
Benzo(a)anthracene	ug/L	5	BDL	190	BDL	BDL	BDL	BDL	BDL	1.2	NA	5	9
Benzo(b)fluoranthene	ug/L	5	BDL	190	BDL	BDL	BDL	BDL	BDL	1.2	ID	5	2
Benzo(k)fluoranthene	ug/L	5	BDL	79	BDL	BDL	BDL	BDL	BDL	12	NA	20	1
Benzo(a)pyrene	ug/L	5	BDL	160	BDL	BDL	BDL	BDL	BDL	0.2 (C)	ID	5	2
Benzo(g, h, i)perylene	ug/L	5	BDL	110	BDL	BDL	BDL	BDL	BDL	26	NA	ID	NA
Chrysene	ug/L	5	BDL	210	BDL	BDL	BDL	BDL	BDL	120	ID	5	2
Dibenzofuran	ug/L	5	BDL	70	BDL	BDL	BDL	BDL	BDL	ID	NA	ID	NA
Fluoranthene	ug/L	5	BDL	430	BDL	11 J	BDL	BDL	BDL	880	IP	>Solubility	206
Fluorene	ug/L	5	BDL	170	BDL	BDL	BDL	BDL	BDL	880	NA	>Solubility	1,980
Indeno(1,2,3-cd)Pyrene	ug/L	5	BDL	110	BDL	BDL	BDL	BDL	BDL	1.2	NA	5	NA
2-Methylnaphthalene	ug/L	5	BDL	41	BDL	BDL	BDL	BDL	BDL	ID	NA	>Solubility	24,600
Naphthalene	ug/L	5	BDL	74	BDL	BDL	BDL	BDL	BDL	260	13	>Solubility	31,000
Phenanthrene	ug/L	5	BDL	580	6 J	7 J	BDL	BDL	BDL	26	5	>Solubility	1,000
Pyrene	ug/L	5	BDL	780	BDL	6 J	BDL	BDL	BDL	550	NA	>Solubility	135
EPA Method 8260													
Cis-1,2-dichloroethene	ug/L	1	SNA	SNA	1 J	BDL	BDL	170 J	14 J	70 (C)	36,000	1.7E+05	3.5E+06
Trans-1,2-dichloroethene	ug/L	1	SNA	SNA	BDL	BDL	BDL	BDL	BDL	100 (C)	25,000	2.0E+05	6.3E+06
1,1,1-Trichloroethane	ug/L	1	SNA	SNA	16 J	BDL	BDL	BDL	BDL	200 (C)	200	3.8E+05	1.3E+06
Trichloroethene	ug/L	1	SNA	SNA	3 J	BDL	BDL	69 J	10 J	5 (C)	200	11,000	1.1E+06

Notes:

ug/L - micrograms per liter
BDL - Below detection limit
SNA - Sample not analyzed for this compound
IP - In process
NLS - A literature search has not been completed
NA - Not available
ID - Inadequate data to develop a criteria
DWV - Drinking water value
GSI - Groundwater Surface Water Interface
GCC - Groundwater Contact Criteria
Bold values exceed GCC.
Italic values exceed GSI.

Shaded values exceed the Health-Based DWV.

(C) - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.
J - Indicates an estimated value; appropriate for qualitative purposes only.

* - Indicates samples collected by Soil and Materials Engineers, Inc.
Only constituents detected above the Detected Level are presented in this table, constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-9
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL - PAOC #5
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification												Residential Infinite Source	Residential Unlimited Land Use	Generic Residential Cleanup	Generic Csat
		SP-4* (6-8')	SP-4* (10-12')	SP-5* (5.5-6.5')	SP-5* (10-12')	SP-6* (1-2')	SP-6* (10-12')	SP-6* (16-18')	SP-7/SB1* (11-13')	SP-7/SB1* (17-19')	SP-9* (5-6')	SP-9* (8-10')	SP-9* (14-16')	VSIC	PSIC	DCV	Csat
EPA Method 8270																	
Anthracene	ug/kg	1,700 J	<330	3,300 J	1,900 J	<330	<330	3,100 J	<330	<330	<330	560 J	<330	1.4E+09	6.7E+10	4.2E+08	NA
Benzo(a)anthracene	ug/kg	<330	<330	710 J	340 J	<330	<330	<330	<330	<330	<330	<330	<330	NLV	ID	14,000	NA
Chrysene	ug/kg	<330	<330	3,100 J	950 J	<330	<330	560 J	<330	<330	<330	<330	<330	ID	ID	1.4E+06	NA
Fluoranthene	ug/kg	3,100 J	<330	9,700 J	4,700 J	<330	<330	4,300 J	<330	<330	<330	1,100 J	<330	7.4E+08	9.3E+09	5.1E+07	NA
Phenanthrene	ug/kg	2,100 J	<330	7,900 J	2,300 J	<330	<330	1,100 J	<330	<330	<330	500 J	<330	1.3E+05	1.3E+08	1.5E+06	NA
Pyrene	ug/kg	910 J	<330	3,600 J	1,100 J	<330	<330	790 J	<330	<330	<330	790 J	<330	6.5E+08	6.7E+09	3.2E+07	NA
Di-n-octyl phthalate	ug/kg	560 J	<330	670 J	650 J	<330	<330	1,000 J	<330	<330	<330	560 J	<330	NLV	ID	7.6E+06	1.4E+08
Butyl benzyl phthalate	ug/kg	<330	<330	710 J	680 J	<330	<330	370 J	<330	<330	<330	<330	<330	NLV	4.7E+10	3.1E+05	3.1E+05
EPA Method 8260																	
Cis-1,2-dichloroethene	ug/kg	BDL	BDL	1,800 J	300 J	BDL	BDL	BDL	340 J	28 J	BDL	BDL	BDL	4.0E+07	5.3E+11	6.4E+05	6.4E+05
Trans- 1,2-dichloroethene	ug/kg	BDL	BDL	21 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.1E+07	5.3E+11	1.4E+06	1.4E+06
Trichloroethene	ug/kg	BDL	250	2,100 J	3,000 J	13 J	BDL	BDL	660 J	72 J	34 J	15 J	10 J	78,000	1.8E+09	1.6E+05	5.0E+05
Vinyl chloride	ug/kg	BDL	BDL	17 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	440	3.7E+07	1,200	4.9E+05
EPA Method 8080																	
PCBs	ug/kg	BDL	BDL	660 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.4E+05	5.2E+06	1,200	NA

Notes:

ug/kg - micrograms per kilogram

BDL - Below detection limit

NA - Not available

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

PCB - polychlorinated biphenyls

VSIC - Volatile Soil Inhalation Criteria

PSIC - Particulate Soil Inhalation Criteria

DCC - Direct Contact Criteria

Csat - Soil saturation screening concentration

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-10
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL - PAOC #5
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Parameter Detected	Units	Detection Level	Sample Identification												Generic Residential Cleanup DCC	Residential Unlimited Land Use PSIC
				SP-4* (6-8')	SP-4* (10-12')	SP-5* (5.5-6.5')	SP-5* (10-12')	SP-6* (1-2')	SP-6* (10-12')	SP-6* (16-18')	SP-7/SB1* (11-13')	SP-7/SB1* (17-19')	SP-9* (5-6')	SP-9* (8-10')	SP-9* (14-16')		
7061	Arsenic	mg/kg	0.1	4.9 J	1.6 J	7.2 J	5.2 J	1.9 J	6.3 J	2.5 J	3.9 J	3.4 J	3.9 J	1.6 J	3.7 J	6.6	720
7081	Barium	mg/kg	1	33 J	21 J	130 J	36 J	79 J	52 J	16 J	72 J	85 J	58 J	22 J	52 J	30,000	330,000
7131	Cadmium	mg/kg	0.05	0.16 J	BDL	0.41 J	0.12 J	0.16 J	0.14 J	0.061 J	0.08 J	0.11 J	0.23 J	0.062 J	0.076 J	2,100	1,700
7191	Chromium	mg/kg	2.5	15 J	3.1 J	11 J	12 J	8.5 J	13 J	0.061 J	10 J	20 J	6.9 J	3.6 J	6.9 J	2,000	2,600
7211	Copper	mg/kg	1	23 J	2.2 J	27 J	8.9 J	6.3 J	11 J	7.1 J	8.6 J	11 J	8.3 J	4.1 J	6.2 J	16,000	130,000
7421	Lead	mg/kg	1	16 J	4.9 J	280 J	19 J	37 J	12 J	4.3 J	11 J	13 J	8.9 J	3.8 J	6.2 J	900	100,000
7470	Mercury	mg/kg	0.1	BDL	BDL	0.29 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	130	ID
7520	Nickel	mg/kg	1	21 J	3.1 J	14 J	17 J	12 J	27 J	8.5 J	17 J	24 J	16 J	6.3 J	30 J	32,000	13,000
7950	Zinc	mg/kg	1	45 J	8.3 J	200 J	37 J	45 J	18 J	18 J	33 J	44 J	59 J	23 J	23 J	140,000	ID

Notes:

mg/kg - milligrams per kilogram

BDL - Below detection limit

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

DCC - Direct Contact Criteria

PSIC - Particulate Soil Inhalation Criteria

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - The detection level for samples analyzed for chromium by SME was 2.5 mg/kg.

Results for selenium, silver, and cyanide were BDL for the above-listed samples and therefore not presented in the this table.

BDL values exceed the Residential DCV.

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-11
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER - PAOC #5
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Detection Level	Parameter Detected	Units	Sample Identification					Residential Health Based DWV	GSI Values	GCC	Water Solubility
				SP-4* (15-20')	SP-5* (16-20')	SP-6* (16-20')	SP-7/SB1* (17')	SP-9* (16-18')				
7421	3	Lead	ug/L	BDL	BDL	BDL	10 J	BDL	4 {A, L}	29**	ID	NA
200.8	20	Zinc	ug/L	BDL	BDL	BDL	85 J	BDL	2,400 {A}	270**	1.2E+08	NA

Notes:

ug/L - micrograms per liter

BDL - Below detection limit

NA - Not available

ID - Inadequate data to develop a criterion

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

DWV - Drinking water value

{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria.

{D} - GSI value is pH, temperature, or water hardness dependent.

{L} - Criteria developed using U.S. EPA Integrated Uptake Biokinetic Model for children. No risk assessment method(s) is currently available to evaluate lead toxicity in adults.

Higher level may be acceptable if soil concentration is less than 400 ppm and groundwater migrating off site will not impact adjacent properties.

J - Indicates estimated value; appropriate for qualitative purposes only.

Bold values exceed the Health-Based DWV.

Only metals detected above the detection level are presented in this table; metals not listed were BDL.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - These values were calculated using a hardness of 265 for the Flint River, per Brenda Sayles, Surface Water Quality Division 8/27/98.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-12
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER - PAOC #5
BASELINE ENVIRONMENTAL SITE ASSESSMENT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Detection Level	Sample Identification					Residential Health Based DWV	GSI Values	GCC	Water Solubility
			SP-4* (15-20')	SP-5* (16-20')	SP-6* (16-20')	SP-7/SB1* (17')	SP-9* (16-18')				
<i>EPA Method 8270</i>											
Anthracene	ug/L	5	BDL	BDL	110 J	BDL	BDL	7,300	NA	>Solubility	43
Fluoranthene	ug/L	5	BDL	BDL	150 J	BDL	BDL	880	IP	>Solubility	206
2-Methylnaphthalene	ug/L	5	BDL	BDL	BDL	BDL	5 J	ID	ID	>Solubility	24,600
Phenanthrene	ug/L	5	BDL	BDL	68 J	BDL	BDL	26	5	>Solubility	1,000
Pyrene	ug/L	5	BDL	BDL	100 J	BDL	BDL	550	NA	>Solubility	135
Butyl benzyl phthalate	ug/L	5	BDL	BDL	5 J	BDL	BDL	1,200	NA	>Solubility	2,690
<i>EPA Method 8260</i>											
Cis-1,2-dichloroethene	ug/L	1	190 J	130 J	9 J	210 J	49 J	70 {C}	ID	1.7E+05	3.5E+06
Trans-1,2-dichloroethene	ug/L	1	3 J	2 J	BDL	BDL	BDL	100 {C}	ID	2.0E+05	6.3E+06
Tetrachloroethene	ug/L	1	1 J	1 J	BDL	21 J	1 J	5 {C}	45	5,000	2.0E+05
1,1,1-Trichloroethane	ug/L	1	69 J	26 J	BDL	280 J	BDL	200 {C}	NA	9,600	1.3E+06
Trichloroethene	ug/L	1	370 J	28 J	12 J	270 J	8 J	5 {C}	200	11,000	1.1E+06
<i>EPA Method 8080</i>											
PCBs	ug/L	0.2	BDL	BDL	BDL	3.1 J	BDL	0.5 {C}	IP	2.4	45

Notes:

ug/L - micrograms per liter
BDL - Below detection limit
NA - Not available
IP - In process
ID - Inadequate data to develop a criteria
PCBs - Polychlorinated biphenyls
DWV - Drinking water value
GSI - Groundwater Surface Water Interface
GCC - Groundwater Contact Criteria
Bold values exceed GCC.
Italic values exceed GSI.

Shaded values exceed the Health-Based DWV.

{C} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.
J - Indicates an estimated value; appropriate for qualitative purposes only.

* - Indicates samples collected by Soil and Materials Engineers, Inc.

Only constituents detected above the Detected Level are presented in this table, constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-13
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL - SOUTHWEST CORNER
FORMER CHROME PLATING AREA
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification				Residential Infinite Source VSIC	Residential Unlimited Land Use PSIC	Generic Residential Cleanup DCC	Generic Csat
		SP-1* (4-6')	SP-1* (10-12')	SP-2* (4-6')	SP-2* (20-22')	SP-3* (2-4')	SP-3* (10-12')		
EPA Method 8260 Trichloroethene Xylenes	ug/kg ug/kg	BDL BDL	BDL BDL	BDL 54 J	23 J BDL	BDL BDL	12 J BDL	1.8E+09 2.9E+11	5.0E+05 1.5E+05

Notes:

ug/kg - micrograms per kilogram

BDL - Below detection limit

J - Indicates estimated value; appropriate for qualitative purposes only.

VSIC - Volatile Soil Inhalation Criteria

PSIC - Particulate Soil Inhalation Criteria

DCC - Direct Contact Criteria

Csat - Soil saturation screening concentration; from "Generic Soil Inhalation Criteria for Ambient Air: Technical Support Document", 04/23/97.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 update)

TABLE D-14
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
METALS IN SOIL - SOUTHWEST CORNER
FORMER CHROME PLATING AREA
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Parameter Detected	Units	Detection Level	Sample Identification					Generic Residential Cleanup DCC	Residential Unlimited Land Use PSIC
				SP-1* (4-6')	SP-1* (10-12')	SP-2* (4-6')	SP-2* (20-22')	SP-3* (2-4')		
7061	Arsenic	mg/kg	0.1	4.7 J	1.3 J	5.3 J	2.5 J	5.2 J	6.6	720
7081	Barium	mg/kg	1	2 J	19 J	28 J	67 J	46 J	30,000	330,000
7131	Cadmium	mg/kg	0.05	0.11 J	0.053 J	0.074 J	0.13 J	0.15 J	2,100	1,700
7191	Chromium	mg/kg	2.5	10 J	2.3 J	12 J	13 J	16 J	2,000	2,600
7211	Copper	mg/kg	1	8.7 J	1.9 J	10 J	6.2 J	1 J	16,000	130,000
7421	Lead	mg/kg	1	13 J	5.2 J	14 J	12 J	68 J	900	100,000
7520	Nickel	mg/kg	1	14 J	3 J	18 J	13 J	13 J	32,000	13,000
7950	Zinc	mg/kg	1	30 J	8.3 J	31 J	31 J	42 J	140,000	ID

Notes:

mg/kg - milligrams per kilogram

BDL - Below detection limit

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

DCC - Direct Contact Criteria

PSIC - Particulate Soil Inhalation Criteria

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

Results for mercury, silver, selenium, and cyanide were BDL for the above-listed samples and therefore not presented in the this table.

Samples collected in March 1997 (BBL)

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-15
SUMMARY OF LABORATORY ANALYTICAL DATA FOR SOIL
ORGANIC COMPOUNDS IN SOIL - SOUTHEAST CORNER
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Sample Identification					Residential Infinite Source VSIC	Residential Unlimited Land Use PSIC	Generic Residential Cleanup DCC	Generic Csat
		SP-10/SB3* (5-7')	SP-10/SB3* (13-15')	SP-11* (4-6')	SP-12* (3-5')	SP-12* (9-11')				
EPA Method 8270										
Anthracene	ug/kg	<330	<330	<330	710 J	<330	1.4E+09	6.7E+10	4.2E+08	NA
Fluoranthene	ug/kg	<330	<330	<330	1,100 J	<330	7.4E+08	9.3E+09	5.1E+07	NA
Phenanthrene	ug/kg	<330	<330	<330	980 J	<330	1.3E+05	1.3E+08	1.5E+06	NA
Pyrene	ug/kg	<330	<330	<330	1,200 J	<330	6.5E+08	6.7E+09	3.2E+07	NA
Di-n-octyl phthalate	ug/kg	<330	<330	<330	960 J	<330	NLV	ID	7.6E+06	1.4E+08
Butyl benzyl phthalate	ug/kg	<330	<330	<330	1,100 J	<330	NLV	4.7E+10	3.1E+05	3.1E+05
Di-n-butyl phthalate	ug/kg	<330	<330	<330	650 J	<330	NLV	3.3E+09	7.6E+05	7.6E+05
EPA Method 8260										
Cis-1,2-dichloroethene	ug/kg	BDL	BDL	BDL	BDL	BDL	4.0E+07	5.3E+11	6.4E+05	6.4E+05
Trichloroethene	ug/kg	BDL	BDL	BDL	BDL	BDL	7.8E+04	1.8E+09	1.6E+05	5.0E+05
Benzene	ug/kg	BDL	BDL	BDL	BDL	BDL	1.3E+04	3.8E+08	8.8E+04	4.0E+05
Toluene	ug/kg	BDL	BDL	BDL	BDL	BDL	2.8E+06	2.7E+10	2.5E+05	2.5E+05
Ethylbenzene	ug/kg	BDL	BDL	BDL	BDL	BDL	9.5E+06	6.7E+10	1.4E+05	1.4E+05
Xylenes	ug/kg	BDL	BDL	BDL	BDL	BDL	4.6E+07	2.9E+11	1.5E+05	1.5E+05

Notes:

ug/kg - micrograms per kilogram

BDL - Below detection limit

NA - Not available

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

VSIC - Volatile Soil Inhalation Criteria

PSIC - Particulate Soil Inhalation Criteria

DCC - Direct Contact Criteria

Csat - Soil saturation screening concentration

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

Samples collected in March 1997 (BBL)

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 19

TABLE D-16
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN SOIL - SOUTHEAST CORNER
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Parameter Detected	Units	Detection Level	Sample Identification				Generic Residential Cleanup DCC	Residential Unlimited Land Use PSIC
				SP-10/SB3* (5-7')	SP-10/SB3* (13-15')	SP-11* (4-6')	SP-12* (3-5')	SP-12* (9-11')	
7061	Arsenic	mg/kg	0.1	5.6 J	2.4 J	5.1 J	6.7 J	3.9 J	720
7081	Barium	mg/kg	1	86 J	49 J	30 J	26 J	34 J	330,000
7131	Cadmium	mg/kg	0.05	0.12 J	0.12 J	BDL	0.066 J	0.071 J	1,700
7191	Chromium **	mg/kg	2.5	14 J	13 J	8.6 J	23 J	13 J	260
7211	Copper	mg/kg	1	9.8 J	7.6 J	13 J	19 J	8 J	130,000
7421	Lead	mg/kg	1	14 J	11 J	68 J	17 J	9.2 J	100,000
7520	Nickel	mg/kg	1	16 J	16 J	18 J	26 J	14 J	13,000
7950	Zinc	mg/kg	1	39 J	30 J	29 J	26 J	22 J	ID

Notes:

mg/kg - micrograms per kilogram

BDL - Below detection limit

J - Indicates estimated value; appropriate for qualitative purposes only.

ID - Inadequate data to develop a criterion

DCC - Direct Contact Criteria

PSIC - Particulate Soil Inhalation Criteria

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - The detection level for samples analyzed for chromium by SME was 2.5 mg/kg.

Results for mercury, silver, selenium, and cyanide were BDL for the above-listed samples and therefore not presented in the this table.

Bold values exceed the Residential DCV.

Samples collected in March 1997 (BBL).

Only constituents detected above the detection level are presented in this table; constituents not listed for each EPA Method were BDL.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 199

TABLE D-17
SUMMARY OF LABORATORY ANALYTICAL DATA
METALS IN GROUNDWATER - SOUTHEAST CORNER
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

EPA Method	Detection Level	Parameter Detected	Units		Sample Identification			Residential Health Based DWV	GSI Values	GCC	Water Solubility
					SP-10/SB3* (15')	SP-11* (16-18')	SP-12* (18-20')				
7081	200	Barium	ug/L	Dissolved	BDL	BDL	270 J	2,000 {A,C}	200	1.5E+07	NA
200.8	20	Zinc	ug/L	Dissolved	27 J	BDL	BDL	2,400 {A}	270**	1.2E+08	NA

Notes:

ug/L - micrograms per liter

BDL - Below detection limit

NA - Not available

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

DWV - Drinking water value

{A} - Background, as defined in Rule 701 (c), may be substituted if higher than the cleanup criteria.

{D} - GSI value is pH, temperature, or water hardness dependent.

{C} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

J - Indicates estimated value; appropriate for qualitative purposes only.

Bold values exceed the Health-Based DWV.

Only metals detected above the detection level are presented in this table; metals not listed were BDL.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

** - These values were calculated using a hardness of 265 for the Flint River, per Brenda Sayles, Surface Water Quality Division, 8/27/98.

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

TABLE D-18
SUMMARY OF LABORATORY ANALYTICAL DATA
ORGANIC COMPOUNDS IN GROUNDWATER - SOUTHEAST CORNER
BASELINE ENVIRONMENTAL ASSESSMENT REPORT

FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN

Parameter Detected	Units	Detection Limit	Sample Identification			Residential Health Based DWV	GSI Values	GCC	Water Solubility
			SP-10/SB3* (15)	SP-11* (16-18)	SP-12* (18-20)				
<i>EPA Method 8260</i>									
Cis-1,2-dichloroethene	ug/L	1	86 J	BDL	BDL	70 {C}	ID	1.7E+05	3.5E+06
Trichloroethene	ug/L	1	42 J	2J	BDL	5 {C}	200	1.1E+04	1.1E+06

Notes:

ug/L - micrograms per liter

ID - Inadequate data to develop a criteria

BDL - Below detection limit

GSI - Groundwater Surface Water Interface

GCC - Groundwater Contact Criteria

DWV - Drinking water value

{C} - State of Michigan Drinking Water Standard established pursuant to Section 5 of the Safe Drinking Water Act, Act No. 399 of the Public Acts of 1976 used as the default.

J - Indicates estimated value; appropriate for qualitative purposes only.

Bold values exceed the Health-Based DWV.

Only metals detected above the detection level are presented in this table; metals not listed were BDL.

* - Indicates samples collected by Soil and Materials Engineers, Inc. (SME).

All relevant generic criteria presented above are from the MDEQ "Training Material for Part 201 Cleanup Criteria," dated January 1998 (with June 1998 updates).

**TABLE D-19
SUMMARY OF DATA EXCEEDING RESIDENTIAL CRITERION
CONSTITUENTS IN SOIL AND GROUNDWATER**

**FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN**

Media	Constituent	Location/ Sample ID	Concentration	Units	Residential Criterion Exceeded
Soil	Arsenic	PAOC 4/SB-P9-4-1	8.5	mg/kg	6.6 DCV
Soil	Arsenic	PAOC 4/SB-P9-4-2	8.8	mg/kg	6.6 DCV
Soil	Arsenic	PAOC 4/SP-15*	42	mg/kg	6.6 DCV
Soil	Arsenic	PAOC 5/SP-5*	7.2	mg/kg	6.6 DCV
Soil	Arsenic	SE Corner/SP-12*	6.7	mg/kg	6.6 DCV
Soil	Benzo (a) pyrene	PAOC 4/SB-P9-4-2	4,000	ug/kg	1,400 DCV
Groundwater	Acenaphthene	PAOC 4/TW-P9-4-2	180	ug/L	19 GSI
Groundwater	Anthracene	PAOC 4/TW-P9-4-2	100	ug/L	43 GCC
Groundwater	Anthracene	PAOC 5/SP-6*	110	ug/L	43 GCC
Groundwater	Barium (Dissolved)	PAOC 1/SP-8*	380	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 1/SP-17*	250	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 1/SP-18*	390	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 4/SP-13*	350	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 4/SP-14*	500	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 4/SP-16*	340	ug/L	200 GSI
Groundwater	Barium (Dissolved)	PAOC 4/SP-20*	230	ug/L	200 GSI
Groundwater	Barium (Dissolved)	SE Corner/SP-12*	270	ug/L	200 GSI
Groundwater	Barium (Total)	PAOC 4/TW-P9-4-1	260	ug/L	200 GSI

**TABLE D-19
SUMMARY OF DATA EXCEEDING RESIDENTIAL CRITERION
CONSTITUENTS IN SOIL AND GROUNDWATER**

**FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN**

Media	Constituent	Location/ Sample ID	Concentration	Units	Residential Criteria Exceeded
Groundwater	Benzo (k) fluoranthene	PAOC 4/TW-P9-4-2	79	ug/L	20 GCC
Groundwater	Chrysene	PAOC 4/TW-P9-4-2	210	ug/L	5 GCC
Groundwater	Copper (Dissolved)	PAOC 4/TW-P9-4-2	30	ug/L	21 GSI
Groundwater	Copper (Total)	PAOC 4/TW-P9-4-1	80	ug/L	21 GSI
Groundwater	Copper (Total)	PAOC 4/TW-P9-4-2	30	ug/L	21 GSI
Groundwater	Cyanide (Total)	PAOC 1/SP-17*	29	ug/L	20 GSI
Groundwater	Cyanide (Total)	PAOC 4/SP-13*	160	ug/L	20 GSI
Groundwater	Cyanide (Total)	PAOC 4/SP-14*	470	ug/L	20 GSI
Groundwater	Fluoranthene	PAOC 4/TW-P9-4-2	430	ug/L	210 GCC
Groundwater	Indeno (1,2,3-cd) pyrene	PAOC 4/TW-P9-4-2	110	ug/L	5 GCC
Groundwater	Lead (Total)	PAOC 4/TW-P9-4-1	48	ug/L	29 GSI
Groundwater	Mercury (Total)	PAOC 4/TW-P9-4-2	0.4	ug/L	0.2 GSI
Groundwater	Naphthalene	PAOC 4/TW-P9-4-2	74	ug/L	13 GSI
Groundwater	Phenanthrene	PAOC 4/TW-P9-4-2	580	ug/L	5 GSI
Groundwater	Phenanthrene	PAOC 4/SP-13*	6	ug/l	5 GSI

**TABLE D-19
SUMMARY OF DATA EXCEEDING RESIDENTIAL CRITERION
CONSTITUENTS IN SOIL AND GROUNDWATER**

**FORMER BUILDING 9
DELPHI-FLINT WEST FACILITY
FLINT, MICHIGAN**

Media	Constituent	Location/ Sample ID	Concentration	Units	Residential Criteria Exceeded
Groundwater	Phenanthrene	PAOC 4/SP-14*	7	ug/L	5 GSI
Groundwater	Phenanthrene	PAOC 5/SP-6*	68	ug/L	5 GSI
Groundwater	Pyrene	PAOC 4/TW-P9-4-2	780	ug/L	140 GCC
Groundwater	Selenium (Dissolved)	PAOC 4/TW-P9-4-2	9	ug/L	5 GSI
Groundwater	Selenium (Total)	PAOC 4/TW-P9-4-2	6	ug/L	5 GSI
Groundwater	Trichloroethene	PAOC 1/SP-8*	250	ug/L	200 GSI
Groundwater	Trichloroethene	PAOC 5/SP-4*	370	ug/L	200 GSI
Groundwater	Trichloroethene	PAOC 5/SP-7/SB1*	270	ug/L	200 GSI
Groundwater	1,1,1- trichloroethane	PAOC 5/SP-7/SB1*	280	ug/L	200 GSI

Notes:

ug/kg - micrograms per kilogram

mg/kg- milligrams per kilogram

ug/L - micrograms per liter

* - indicates samples collected by Soil and Materials Engineers, Inc. (SME).

MDEQ - Michigan Department of Environmental Quality

DCV - Generic Residential Direct Contact Value from MDEQ OM #8, Revision 4.

GSI - Groundwater/Surface Water Interface from MDEQ "New GSI Cleanup Criteria - Addendum to OM #8 Revision 4 and OM #14 Revision 2" as of 02/03/98.

GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria: Technical Support Document" dated 01/17/97.

PART E - OVERALL EVALUATION OF FIELD DATA

1. Statistical Approach and Evaluation

1.1 Statistical Approach

The purpose of the statistical evaluation was to determine a concentration that would be representative of the actual concentration that someone would be expected to encounter at the property. In order to determine if the site is a "facility", BBL calculated a 95% UCL for the mean of all compounds for which at least a single data point exceeded the relevant generic criteria for a residential exposure scenario. Statistical methods commonly used to determine a 95% UCL of the mean require a normally distributed data set. The site data was tested for normality to determine the appropriate statistical approach. The Shapiro-Wilk test of Normality was used to test each data set as outlined in the EPA document titled "Statistical Training Course For Ground-water Monitoring Data Analysis" (documentation is included in Appendix B).

1.2 Statistical Evaluation

The data sets tested failed to exhibit a normal distribution. This occurrence is common in groundwater data sets with a large number of BDL results. A log transformation of the data set often transforms a data set into a normal distribution. Because the data sets failed to exhibit a normal distribution even after a log transformation, BBL calculated a Non-Parametric Confidence Interval for each constituent. The Non-Parametric Confidence Interval does not require normal distribution of the data set. The method for computing the Non-Parametric Confidence Interval is contained in the EPA document "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities" (documentation is included in Appendix B). Using this method, BBL calculated the following 95% UCL of the median for the compounds for which at least a single data point exceeded the relevant generic residential criteria:

Medium	Constituent	Median Concentration	Units	Residential Criteria
Soil	Arsenic	4.9	mg/kg	6.6 DCC
Soil	Benzo (a) pyrene	<330	ug/kg	1,400 DCC
Groundwater	Acenaphthene	<5	ug/L	19 GSI
Groundwater	Anthracene	<5	ug/L	43 GCC
Groundwater	Benzo (k) fluoranthene	<5	ug/L	20 GCC
Groundwater	Benzo (a) anthracene*	<5	ug/L	5 GCC
Groundwater	Benzo (a) pyrene*	<5	ug/L	5 GCC
Groundwater	Benzo (b) fluoranthene*	<5	ug/L	5 GCC
Groundwater	Barium (Dissolved)	270 J	ug/L	200 GSI
Groundwater	Chrysene*	<5	ug/L	5 GCC
Groundwater	Copper (Dissolved)	<25	ug/L	21 GSI
Groundwater	Cyanide (Total)	<3	ug/L	20 GSI

Part E - Overall Evaluation of Field Data

Privileged & Confidential
Prepared at Request of General Motors Counsel

Medium	Constituent	Median Concentration	Units	Residential Criteria
Groundwater	Fluoranthene	<5	ug/L	210 GCC
Groundwater	Indeno (1,2,3-cd) pyrene*	<5	ug/L	5 GCC
Groundwater	Naphthalene	<5	ug/L	13 GSI
Groundwater	Phenanthrene*	<5	ug/L	5 GSI
Groundwater	Pyrene*	<5	ug/L	140 GCC
Groundwater	Selenium (Dissolved)	<3	ug/L	5 GSI
Groundwater	Trichloroethene	71	ug/L	200 GSI
Groundwater	1,1,1-Trichloroethane	<1	ug/L	200 GSI

Notes:

J - indicates an estimated value, appropriate for qualitative purposes only

* - indicates that the data set for this constituent contained greater than 90 % of the results reported as BDL

PCBs - Polychlorinated biphenyls

ug/kg - micrograms per kilogram

mg/kg - milligrams per kilogram

ug/L - micrograms per liter

MDEQ - Michigan Department of Environmental Quality

DCC - Generic Residential Direct Contact Value from MDEQ OM #8 Revision 4.

GCC - Groundwater Contact Criteria from MDEQ "Generic Groundwater Contact Criteria: Technical Support Document." January 17, 1997

GSI - Groundwater Surface Water Interface Criteria from MDEQ "New Groundwater/Surface Water Interface (GSI) Cleanup Criteria - Addendum to OM #8, Revision 4, and OM#14, Revision 2.

This evaluation shows that only the 95% UCL for barium exceeded relevant generic residential criteria. This exceedance is limited to the GSI criteria and the property is not at the GSI. There was no evidence of barium contaminated groundwater between the parcel and the Flint River. Therefore, it is expected that groundwater concentrations of barium will attenuate as groundwater migrates the distance (greater than 500 feet) to the GSI. Consequently, the site should not be considered a "facility" as defined in Part 201 of PA 451. The statistical evaluation is presented in Appendix C.

It should be noted that samples were collected during the Phase II ESI for both total and dissolved metals analysis. Comparison of total metals to GSI criteria is not valid. The 95% UCL for dissolved metals was used for comparison to the GSI criteria.

2. Findings and Conclusions of Baseline Environmental Site Assessment

In summary, the data collected by SME were consistent with BBL's findings and indicate that on-site soils and groundwater do not exceed relevant generic cleanup criteria.

For positive detections of soil and groundwater constituents above relevant criteria, statistical procedures were utilized to determine if statistically significant concentrations were present, and if those concentrations exceeded relevant criteria. None of the constituents detected exceeded GCC or DCCs after appropriate statistical procedures were applied.

The statistical evaluation showed that only the 95% UCL for barium exceeded the GSI criteria. The property is not at the GSI. It is expected that groundwater concentrations of barium will attenuate as groundwater migrates the distance (greater than 500 feet) to the GSI. Consequently, the site should not be considered a "facility" as defined in Part 201 of PA 451.

The water-bearing unit present is not an aquifer, so HB DWVs are not applicable.

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APPENDIX A

EAM

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DATA VALIDATION REPORT

Project: BBL/GM Building 9, Flint West Facility
Soil and Materials Engineers, Inc. Project Number PE28 979
Consumers Energy Project Number CHEM-97-2385

January 16, 1998

Data Validation performed by
Environmental & Analytical Management, Inc.

For

Blasland, Bouck & Lee,
Boca Raton, Florida

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Environmental & Analytical Management, Inc (EAM) was contracted by Blasland, Bouck & Lee (BBL) to review and validate the analytical data package prepared by Soils & Materials Engineers (S&ME) and Consumers Energy (CE). The analytical data package consisted of the following:

- 1) S&ME cover letter dated December 11, 1997,
- 2) Consumers Energy Memorandum listing the analytical methods dated December 2, 1997,
- 3) Analytical Data divided into five tables (A - E).

The analytical data validation procedures conducted were based on *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis, December, 1994*, and *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis, December, 1994*.

EAM routinely conducts data validation at three levels of inquiry (QA Level I, II and III), each successively more detailed. The more detailed the validation procedure, the more extensive reporting from the laboratory is required. QA Level I data validation procedure reviews the USEPA method QA requirements by reviewing the laboratories back-up data of these requirements. A preliminary review of the data package focussed on the reported data, and requested additional data from the laboratory to provide the minimum data requirements for a QA Level I data validation procedure. A review of the additional data received on January 7, 1998 indicated that additional data is required to complete the Level I QA data validation procedure. Additional QA data was requested and received on January 14 and 15, 1998. Telephone interviews with Mr. Bill Voight of CE indicated that S&ME did not request or indicate the level of QA data or back-up data required. The following table lists the necessary data to conduct a QA Level I validation procedure, the CE data package contents and additional data received:

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QA Level I	QA Level I Data	CE Report	Additional CE Data (1) 1/7/98	Additional CE Data (2) 1/14/98	Additional CE Data (3) 1/15/98
8260A, 8270A	Water Blank, RWS, RWSD, RPD	Surrogate Recovery	Continuing Calibration		Soil matrix spike, method blank
8080A	Water Blank, RWS, RWSD, RPD	None	Verbal surrogate recoveries on two GW samples. On-going calibration chromatograms and table	All chromatograms from (1) with headers and run numbers, method blank chromat.	
Metals	Water Blanks, RWS, RWSD, RPD	None			Metals Spike in reagent water table

- 1) Data requested was the chromatograms of aqueous PCB samples with positive results and associated continuing calibration spikes of Aroclor 1242, 1254 and 1260. Surrogate recoveries were also requested.
- 2) Data requested included header data on chromatograms submitted in (1), method blank data, MS and MSD data.
- 3) Received method blank data and MS data.

QA level I data validation requires water blanks, RWS, RWSD, Accuracy and RPD calculations.

Table A1 - USEPA SW-846 Method 8260A - Surrogate recoveries were analyzed and reported for each sample. The surrogate recoveries were within the criteria specified in the analytical Table. Matrix spike data (actually reagent water spike data) was reported and within acceptance criteria specified in the analytical

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Table. The method blank summary reports dated 11/7, 11/8, 11/10 and 11/11/97 were reviewed. Low levels of methylene chloride, trifluorochloromethane and benzene were found in one or some of the blanks, however, this appeared not to effect the data (no compounds were found in samples or at levels near detection limits and the 5X and 10X criteria). Method 8260A requires that a spike and spike duplicate be analyzed with every sample batch to generate accuracy and precision data for the method. No spike duplicate data was analyzed as specified and required in the analytical method. The accuracy and precision data that defines the method performance is unknown.

The sampling techniques used in conjunction with the data validation procedure performed renders the 8260A positive data to be flagged J as estimated and is useable for qualitative purposes.

Table B1 - USEPA SW-846 Method 8270A - Surrogate recoveries were reported for each sample. The surrogate recoveries were within the criteria specified in the analytical Table. Matrix spike data (actually reagent water spike data) was reported and within acceptance criteria specified in the analytical Table. Method 8270A requires that a spike and spike duplicate be analyzed with every sample batch to generate accuracy and precision data for the method. No spike duplicate data was analyzed. The accuracy and precision data that defines the method performance is unknown.

The sampling techniques used in conjunction with the data validation procedure performed renders the 8270A positive data to be flagged J as estimated and is useable for qualitative purposes.

Table C1 - USEPA SW-846 Method 8080A - Partial chromatograms for samples SP9S7, SP14GW and SP7/SB1 were reviewed. Peak identification based on continuing calibration chromatograms is consistent. Sample SP14GW was identified at the detection limit. The surrogate recoveries were reported verbally by Bill Voight of CE for the ground water samples. Decachlorobiphenyl (DCB) was the only surrogate used. The chromatograms provided by CE did not show the last part of the chromatogram where DCB's retention time is (@72 minutes). Bill Voight indicated that faxing the DCB peak chromatogram would be too costly and time consuming. Mr. Voight proceeded to refax the sample chromatogram with the DCB recoveries hand written on the PCB chromatogram. The DCB recoveries were within limits. No surrogate recoveries were analyzed on the soil samples, as specified and required in the method. A method blank chromatogram was reviewed that indicated by hand writing that

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this water method blank is for the set of samples analyzed on 11/14/97, which were soils, and therefore does not meet the method requirements. The chromatogram was dated 11/21/97. The PCB samples were run over a 20-day period. Samples SP17GW, SP19GW and SP20GW were extracted after the seven-day holding time. Method 8080A requires that a spike and spike duplicate be analyzed with every sample batch to generate accuracy and precision data for the method. No spike duplicate data was analyzed as specified and required in the analytical method. The accuracy and precision data that defines the method performance is unknown.

Based on this review, the method 8080A data is flagged J as estimated and is useable for qualitative purposes.

Table D1 - USEPA SW-846 Method 9010A^{Cyanide} - This method requires a verification standard (midpoint/laboratory control spike) and a blank. Mr. Bill Voight indicated verbally the following:

- 1) a five-point curve was constructed ranging from 0-30 ug/L.
- 2) A distillation spike was analyzed and within limits.
- 3) On soil sample #2385-6, an MS (726) and MSD (750) was analyzed (630 ug/L and 690 ug/L, respectively).
- 4) End of run calibration check was within CE's limits.
- 5) Mr. Voight verified that the aqueous MS and MSD data was acceptable.

Based on this review, the data is useable for quantitative interpretation.

Table E1 - USEPA SW-846 Methods 7061, 7081, 7131, 7191, 7211, 7421, 7470, 7520, 7741, 7761 and 7950 - No blank data was reported, however, blank water is used for zeroing the instrument, which is not in conformance with the method. A matrix spike (reagent water) was run and the recoveries were within limits specified in the report. No duplicate or spike duplicate was analyzed as required by the method.

This does not conform to the methods and therefore all positive data is flagged J as estimated and can only be used for qualitative interpretation.

Validation performed by:



Sven R. Pavlovics, R.E.M.

Date 1/19/98

APPENDIX B

The Skewness Coefficient may be computed using the following formula:

$$\gamma_1 = \frac{\frac{1}{n} \sum_i (x_i - \bar{x})^3}{\left(\frac{n-1}{n} \right)^{\frac{3}{2}} (SD)^3}$$

where the numerator represents the average cubed residual and SD denotes the standard deviation of the measurements. Most statistics computer packages (e.g., Minitab, GEO-EAS) will compute the Skewness Coefficient automatically via a simple command.

EXAMPLE 2

Using the data in Example 1, compute the Skewness Coefficient to test for approximate symmetry in the data.

SOLUTION

Step 1. Compute the mean, standard deviation (SD), and average cubed residual for the nickel concentrations:

$$\bar{x} = 169.52 \text{ ppb}$$

$$SD = 259.72 \text{ ppb}$$

$$\frac{1}{n} \sum_i (x_i - \bar{x})^3 = 2.98923 * 10^4 \text{ ppb}^3$$

Step 2. Calculate the Coefficient of Skewness using the previous formula to get $\gamma_1 = 1.84$. Since the skewness is much larger than 1, the data appear to be significantly positively skewed. Do not assume that the data follow a Normal distribution.

Step 3. Since the original data evidence a high degree of skewness, one can attempt to compute the Skewness Coefficient on the logged data instead. In that case, the skewness works out to be $|\gamma_1| = 0.24 < 1$, indicating that the logged data values are slightly skewed, but not enough to reject an assumption of Normality in the logged data. In other words, the original data may be Lognormally distributed.

1.1.4 The Shapiro-Wilk Test of Normality ($n \leq 50$)

The Shapiro-Wilk test is recommended as a superior alternative to the Chi-square test for testing Normality of the data. It is based on the premise that if a set of data are Normally distributed, the ordered values should be highly correlated with corresponding quantiles taken from a Normal distribution (Shapiro and Wilk, 1965). In particular, the Shapiro-Wilk test gives

substantial weight to evidence of non-Normality in the tails of a distribution, where the robustness of statistical tests based on the Normality assumption is most severely affected. The Chi-square test treats departures from Normality in the tails nearly the same as departures in the middle of a distribution, and so is less sensitive to the types of non-Normality that are most crucial. One cannot tell from a significant Chi-square goodness-of-fit test what sort of non-Normality is indicated.

The Shapiro-Wilk test statistic (W) will tend to be large when a Probability Plot of the data indicates a nearly straight line. Only when the plotted data show significant bends or curves will the test statistic be small. The Shapiro-Wilk test is considered to be one of the very best tests of Normality available (Miller, 1986; Madansky, 1988).

To calculate the test statistic W , one can use the following formula:

$$W = \left[\frac{b}{SD\sqrt{n-1}} \right]^2$$

where the numerator is computed as

$$b = \sum_{i=1}^k a_{n-i+1} (x_{(n-i+1)} - x_{(i)}) = \sum_{i=1}^k b_i$$

In this last formula, $x_{(j)}$ represents the j th smallest ordered value in the sample and coefficients a_j depend on the sample size n . The coefficients can be found for any sample size from 3 up to 50 in Table A-1 of Appendix A. The value of k can be found as the greatest integer less than or equal to $n/2$.

Normality of the data should be rejected if the Shapiro-Wilk statistic is too low when compared to the critical values provided in Table A-2 of Appendix A. Otherwise one can assume the data are approximately Normal for purposes of further statistical analysis. As before, it is recommended that the test first be performed on the logarithms of the original data to test for Lognormality. If the logged data indicate non-Normality by the Shapiro-Wilk test, a re-test can be performed on the original data to test for Normality of the original concentrations.

EXAMPLE 3

Use the data of Example 1 to compute the Shapiro-Wilk test of Normality.

SOLUTION

Step 1. Order the data from smallest to largest and list, as in the following table. Also list the data in reverse order alongside the first column.

Step 2. Compute the differences $x_{(n-i+1)} - x_{(i)}$ in column 3 of the table by subtracting column 1 from column 2.

i	$x_{(i)}$	$x_{(n-i+1)}$	$x_{(n-i+1)} - x_{(i)}$	a_{n-i+1}	b_i
1	1.0	942.0	941.0	.4734	445.47
2	3.1	637.0	633.9	.3211	203.55
3	8.7	578.0	569.3	.2565	146.03
4	10.0	331.0	321.0	.2085	66.93
5	14.0	262.0	248.0	.1686	41.81
6	19.0	151.0	132.0	.1334	17.61
7	21.4	85.6	64.2	.1013	6.50
8	27.0	81.5	54.5	.0711	3.87
9	39.0	64.4	25.4	.0422	1.07
10	56.0	58.8	2.8	.0140	0.04
11	58.8	56.0	-2.8		b=932.88
12	64.4	39.0	-25.4		
13	81.5	27.0	-54.5		
14	85.6	21.4	-64.2		
15	151.0	19.0	-132.0		
16	262.0	14.0	-248.0		
17	331.0	10.0	-321.0		
18	578.0	8.7	-569.3		
19	637.0	3.1	-633.9		
20	942.0	1.0	-941.0		

Step 3. Compute k as the greatest integer less than or equal to $n/2$. Since $n=20$, $k=10$ in this example.

Step 4. Look up the coefficients a_{n-i+1} from Table A-1 and list in column 4. Multiply the differences in column 3 by the coefficients in column 4 and add the first k products to get quantity b. In this case, $b=932.88$.

Step 5. Compute the standard deviation of the sample, $SD=259.72$. Then

$$W = \left[\frac{932.88}{259.72\sqrt{19}} \right]^2 = 0.679.$$

if Table value > calculated value
Non Normal Data

Step 6. Compare the computed value of $W=0.679$ to the 5% critical value for sample size 20 in Table A-2, namely $W_{.05,20}=0.905$. Since $W < 0.905$, the sample shows significant evidence of non-Normality by the Shapiro-Wilk test. The data should be transformed using natural logs and rechecked using the Shapiro-Wilk test before proceeding with further statistical analysis (Actually, the logged data should have been tested first. The

TABLE A-1.

COEFFICIENTS $\{A_{N-I+1}\}$ FOR W TEST OF
NORMALITY, FOR $N=2(1)50$

i/n	2	3	4	5	6	7	8	9	10	
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739	
2	—	.0000	.1677	.2413	.2806	.3031	.3164	.3244	.3291	
3	—	—	—	.0000	.0875	.1401	.1743	.1976	.2141	
4	—	—	—	—	—	.0000	.0561	.0947	.1224	
5	—	—	—	—	—	—	—	.0000	.0399	
i/n	11	12	13	14	15	16	17	18	19	20
1	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886	0.4808	0.4734
2	.3315	.3325	.3325	.3318	.3306	.3290	.3273	.3253	.3232	.3211
3	.2260	.2347	.2412	.2460	.2495	.2521	.2540	.2553	.2561	.2565
4	.1429	.1586	.1707	.1802	.1878	.1939	.1988	.2027	.2059	.2085
5	.0695	.0922	.1099	.1240	.1353	.1447	.1524	.1587	.1641	.1686
6	0.0000	0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197	0.1271	0.1334
7	—	—	.0000	.0240	.0433	.0593	.0725	.0837	.0932	.1013
8	—	—	—	—	.0000	.0196	.0359	.0496	.0612	.0711
9	—	—	—	—	—	—	.0000	.0163	.0303	.0422
10	—	—	—	—	—	—	—	—	.0000	.0140
i/n	21	22	23	24	25	26	27	28	29	30
1	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254
2	.3185	.3156	.3126	.3098	.3069	.3043	.3018	.2992	.2968	.2944
3	.2578	.2571	.2563	.2554	.2543	.2533	.2522	.2510	.2499	.2487
4	.2119	.2131	.2139	.2145	.2148	.2151	.2152	.2151	.2150	.2148
5	.1736	.1764	.1787	.1807	.1822	.1836	.1848	.1857	.1864	.1870
6	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630
7	.1092	.1150	.1201	.1245	.1283	.1316	.1346	.1372	.1395	.1415
8	.0804	.0878	.0941	.0997	.1046	.1089	.1128	.1162	.1192	.1219
9	.0530	.0618	.0696	.0764	.0823	.0876	.0923	.0965	.1002	.1036
10	.0263	.0368	.0459	.0539	.0610	.0672	.0728	.0778	.0822	.0862
11	0.0000	0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697
12	—	—	.0000	.0107	.0200	.0284	.0358	.0424	.0483	.0537
13	—	—	—	—	.0000	.0094	.0178	.0253	.0320	.0381
14	—	—	—	—	—	—	.0000	.0084	.0159	.0227
15	—	—	—	—	—	—	—	—	.0000	.0076
i/n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.3989	0.3964
2	.2921	.2898	.2876	.2854	.2834	.2813	.2794	.2774	.2755	.2737
3	.2475	.2463	.2451	.2439	.2427	.2415	.2403	.2391	.2380	.2368
4	.2145	.2141	.2137	.2132	.2127	.2121	.2116	.2110	.2104	.2098
5	.1874	.1878	.1880	.1882	.1883	.1883	.1883	.1881	.1880	.1878
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	.1433	.1449	.1463	.1475	.1487	.1496	.1503	.1513	.1520	.1526
8	.1243	.1265	.1284	.1301	.1317	.1331	.1344	.1356	.1366	.1376
9	.1066	.1093	.1118	.1140	.1160	.1179	.1196	.1211	.1225	.1237
10	.0899	.0931	.0961	.0988	.1013	.1036	.1056	.1075	.1092	.1108

TABLE A-1. (CONTINUED)

COEFFICIENTS $\{A_{N-I+1}\}$ FOR W TEST OF
NORMALITY, FOR $N=2(1)50$

i/n	31	32	33	34	35	36	37	38	39	40
11	0.0739	0.0777	0.0812	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	.0585	.0629	.0669	.0706	.0739	.0770	.0798	.0824	.0848	.0870
13	.0435	.0485	.0530	.0572	.0610	.0645	.0677	.0706	.0733	.0759
14	.0289	.0344	.0395	.0441	.0484	.0523	.0559	.0592	.0622	.0651
15	.0144	.0206	.0262	.0314	.0361	.0404	.0444	.0481	.0515	.0546
16	0.0000	0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17	—	—	.0000	.0062	.0119	.0172	.0220	.0264	.0305	.0343
18	—	—	—	—	.0000	.0057	.0110	.0158	.0203	.0244
19	—	—	—	—	—	—	.0000	.0053	.0101	.0146
20	—	—	—	—	—	—	—	—	.0000	.0049
i/n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	.2719	.2701	.2684	.2667	.2651	.2635	.2620	.2604	.2589	.2574
3	.2357	.2345	.2334	.2323	.2313	.2302	.2291	.2281	.2271	.2260
4	.2091	.2085	.2078	.2072	.2065	.2058	.2052	.2045	.2038	.2032
5	.1876	.1874	.1871	.1868	.1865	.1862	.1859	.1855	.1851	.1847
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	.1531	.1535	.1539	.1542	.1545	.1548	.1550	.1551	.1553	.1554
8	.1384	.1392	.1398	.1405	.1410	.1415	.1420	.1423	.1427	.1430
9	.1249	.1259	.1269	.1278	.1286	.1293	.1300	.1306	.1312	.1317
10	.1123	.1136	.1149	.1160	.1170	.1180	.1189	.1197	.1205	.1212
11	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	.0891	.0909	.0927	.0943	.0959	.0972	.0986	.0998	.1010	.1020
13	.0782	.0804	.0824	.0842	.0860	.0876	.0892	.0906	.0919	.0932
14	.0677	.0701	.0724	.0745	.0775	.0785	.0801	.0817	.0832	.0846
15	.0575	.0602	.0628	.0651	.0673	.0694	.0713	.0731	.0748	.0764
16	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	.0379	.0411	.0442	.0471	.0497	.0522	.0546	.0568	.0588	.0608
18	.0283	.0318	.0352	.0383	.0412	.0439	.0465	.0489	.0511	.0532
19	.0188	.0227	.0263	.0296	.0328	.0357	.0385	.0411	.0436	.0459
20	.0094	.0136	.0175	.0211	.0245	.0277	.0307	.0335	.0361	.0386
21	0.0000	0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22	—	—	.0000	.0042	.0081	.0118	.0153	.0185	.0215	.0244
23	—	—	—	—	.0000	.0039	.0076	.0111	.0143	.0174
24	—	—	—	—	—	—	.0000	.0037	.0071	.0104
25	—	—	—	—	—	—	—	—	.0000	.0035

TABLE A-2.
PERCENTAGE POINTS OF THE W TEST FOR $N=3(1)50$

n	0.01	0.05
3	0.753	0.767
4	.687	.748
5	.686	.762
6	0.713	0.788
7	.730	.803
8	.749	.818
9	.764	.829
10	.781	.842
11	0.792	0.850
12	.805	.859
13	.814	.866
14	.825	.874
15	.835	.881
16	0.844	0.887
17	.851	.892
18	.858	.897
19	.863	.901
20	.868	.905
21	0.873	0.908
22	.878	.911
23	.881	.914
24	.884	.916
25	.888	.918
26	0.891	0.920
27	.894	.923
28	.896	.924
29	.898	.926
30	.900	.927
31	0.902	0.929
32	.904	.930
33	.906	.931
34	.908	.933
35	.910	.934

TABLE A-2. (CONTINUED)

PERCENTAGE POINTS OF THE W TEST FOR $N=3(1)50$

n	0.01	0.05
36	0.912	0.935
37	.914	.936
38	.916	.938
39	.917	.939
40	.919	.940
41	0.920	0.941
42	.922	.942
43	.923	.943
44	.924	.944
45	.926	.945
46	0.927	0.945
47	.928	.946
48	.929	.947
49	.929	.947
50	.930	.947

in this case). If the lower end of the confidence interval exceeds the appropriate compliance limit, then the mean concentration must exceed that compliance limit. These results provide statistically significant evidence of contamination.

6.2.1.3 Nonparametric Confidence Interval

If the data do not adequately follow the normal distribution even after the logarithm transformation, a nonparametric confidence interval can be constructed. This interval is for the median concentration (which equals the mean if the distribution is symmetric). The nonparametric confidence interval is generally wider and requires more data than the corresponding normal distribution interval, and so the normal or log-normal distribution interval should be used whenever it is appropriate. It requires a minimum of seven (7) observations in order to construct an interval with a two-sided confidence coefficient of 98%, corresponding to a one-sided confidence coefficient of 99%. Consequently, it is applicable only for the pooled concentration of compliance wells at a single point in time or for special sampling to produce a minimum of seven observations at a single well during the sampling period.

PURPOSE

The nonparametric confidence interval is used when the raw data have been found to violate the normality assumption, a log-transformation fails to normalize the data, and no other specific distribution is assumed. It produces a simple confidence interval that is designed to contain the true or population median concentration with specified confidence (here 99%). If this confidence interval contains the compliance limit, it is concluded that the median concentration does not differ significantly from the compliance limit. If the interval's lower limit exceeds the compliance limit, this is statistically significant evidence that the concentration exceeds the compliance limit and the unit is out of compliance.

PROCEDURE

Step 1. Within each compliance well, order the n data from least to greatest, denoting the ordered data by $X(1), \dots, X(n)$, where $X(i)$ is the i th value in the ordered data.

Step 2. Determine the critical values of the order statistics as follows. If the minimum seven observations is used, the critical values are 1 and 7. Otherwise, find the smallest integer, M , such that the cumulative binomial distribution with parameters n (the sample size) and $p = 0.5$ is at least 0.99. Table 6-3 gives the values of M and $n+1-M$ together with the exact confidence coefficient for sample sizes from 4 to 11. For larger samples, take as an approximation the nearest integer value to

$$M = n/2 + 1 + Z_{0.99} \sqrt{(n/4)}$$

where $Z_{0.99}$ is the 99th percentile from the normal distribution (Table 4, Appendix 8) and equals 2.33.

TABLE 6-3. VALUES OF M AND $n+1-M$ AND CONFIDENCE COEFFICIENTS FOR SMALL SAMPLES

n	M	$n+1-M$	Two-sided confidence
4	4	1	87.5%
5	5	1	93.8%
6	6	1	96.9%
7	7	1	98.4%
8	8	1	99.2%
9	9	1	99.6%
10	9	2	97.9%
11	10	2	98.8%

Step 3. Once M has been determined in Step 2, find $n+1-M$ and take as the confidence limits the order statistics, $X(M)$ and $X(n+1-M)$. (With the minimum seven observations, use $X(1)$ and $X(7)$.)

Step 4. Compare the confidence limits found in Step 3 to the compliance limit. If the lower limit, $X(M)$ exceeds the compliance limit, there is statistically significant evidence of contamination. Otherwise, the unit remains in compliance.

REMARK

The nonparametric confidence interval procedure requires at least seven observations in order to obtain a (one-sided) significance level of 1% (confidence of 99%). This means that data from two (or more) wells or sampling periods would have to be pooled to achieve this level. If only the four observations from one well taken at a single sampling period were used, the one-sided significance level would be 6.25%. This would also be the false alarm rate.

Ties do not affect the procedure. If there are ties, order the observations as before, including all of the tied values as separate observations. That is, each of the observations with a common value is included in the ordered list (e.g., 1, 2, 2, 2, 3, 4, etc.). For ties, use the average of the tied ranks as in Section 5.2.2, Step 1 of the example. The ordered statistics are found by counting positions up from the bottom of the list as before. Multiple values from separate observations are counted separately.

EXAMPLE

Table 6-4 contains concentrations of Silvex in parts per million from two hypothetical compliance wells. The data are assumed to consist of four samples taken each quarter for a year, so that sixteen observations are available

TABLE 6-4. EXAMPLE DATA FOR NONPARAMETRIC CONFIDENCE INTERVAL--SILVEX CONCENTRATIONS (ppm)

Sampling date	Well 1		Well 2	
	Concentration (ppm)	Rank	Concentration (ppm)	Rank
Jan. 1	3.17	(2)	3.52	(6)
	2.32	(1)	12.32	(15)
	7.37	(11)	2.28	(4)
	4.44	(6)	5.30	(7)
Apr. 1	9.50	(13)	8.12	(11)
	21.36	(16)	3.36	(5)
	5.15	(7)	11.02	(14)
	15.70	(15)	35.05	(16)
Jul. 1	5.58	(8)	2.20	(3)
	3.39	(3)	0.00	(1.5)
	8.44	(12)	9.30	(12)
	10.25	(14)	10.30	(13)
Oct. 1	3.65	(4)	5.93	(8)
	6.15	(9)	6.39	(9)
	6.94	(10)	0.00	(1.5)
	3.74	(5)	6.53	(19)

from each well. The data are not normally distributed, neither as raw data nor when log transformed. Thus, the nonparametric confidence interval is used. The MCL is taken to be 25 ppm.

Step 1. Order the 16 measurements from least to greatest within each well separately. The numbers in parentheses beside each concentration in Table 6-4 are the ranks or order of the observation. For example, in Well 1, the smallest observation is 2.32, which has rank 1. The second smallest is 3.17, which has rank 2, and so forth, with the largest observation of 21.36 having rank 16.

Step 2. The sample size is large enough so that the approximation is used to find M.

$$M = 16/2 + 1 + 2.33 \sqrt{(16/4)} = 13.7 = 14$$

Step 3. The approximate 95% confidence limits are given by the $16 + 1 - 14 = 3$ rd largest observation and the 14th largest observation. For

Well 1, the 3rd observation is 3.39 and the 14th largest observation is 10.25. Thus the confidence limits for Well 1 are (3.39, 10.25). Similarly for Well 2, the 3rd largest observation and the 14th largest observation are found to give the confidence interval (2.20, 11.02). Note that for Well 2 there were two values below detection. These were assigned a value of zero and received the two smallest ranks. Had there been three or more values below the limit of detection, the lower limit of the confidence interval would have been the limit of detection because these values would have been the smallest values and so would have included the third order statistic.

Step 4. Neither of the two confidence intervals' lower limit exceeds the MCL of 25. In fact, the upper limit is less than the MCL, implying that the concentration in each well is significantly below the MCL.

INTERPRETATION

The rank-order statistics used to form the confidence interval in the nonparametric confidence interval procedure will contain the population median with confidence coefficient of 98%. The population median equals the mean whenever the distribution is symmetric. The nonparametric confidence interval is generally wider and requires more data than the corresponding normal distribution interval, and so the normal or log-normal distribution interval should be used whenever it is appropriate.

If the confidence interval contains the compliance limit (either MCL or ACL), then it is reasonable to conclude that the median compliance well concentration does not differ significantly from the compliance limit. If the lower end of the confidence interval exceeds the compliance limit, this is statistically significant evidence at the 1% level that the median compliance well concentration exceeds the compliance limit and the unit is out of compliance.

6.2.2 Tolerance Intervals for Compliance Limits

In some cases a permit may specify that a compliance limit (MCL or ACL) is not to be exceeded more than a specified fraction of the time. Since limited data will be available from each monitoring well, these data can be used to estimate a tolerance interval for concentrations from that well. If the upper end of the tolerance interval (i.e., upper tolerance limit) is less than the compliance limit, the data indicate that the unit is in compliance. That is, concentrations should be less than the compliance limit at least a specified fraction of the time. If the upper tolerance limit of the interval exceeds the compliance limit, then the concentration of the hazardous constituent could exceed the compliance limit more than the specified proportion of the time.

This procedure compares an upper tolerance limit to the MCL or ACL. With small sample sizes the upper tolerance limit can be fairly large, particularly if large coverage with high confidence is desired. If the owner or operator wishes to use a tolerance limit in this application, he/she should suggest values for the parameters of the procedure subject to the approval of the Regional Administrator. For example, the owner or operator could suggest a

APPENDIX C

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %

Arsenic	mg/kg	soil
SB-P9-1-1	3.1	1.3
SB-P9-2-3	5.8	1.3
SB-P9-3-1	12	1.6
SB-P9-4-1	4.7	1.6
SB-P9-4-1	8.5	1.6
SB-P9-4-2	8.8	1.9
SB-P9-4-2	1.3	2.4
SP-1 (4-6')	4.7	2.4
SP-1 (10-12')	1.3	2.5
SP-2 (4-6')	5.3	2.5
SP-2 (20-22')	2.5	2.7
SP-3 (2-4')	5.2	3
SP-3 (10-12')	1.6	3.1
SP-4 (6-8')	4.9	3.1
SP-4 (10-12')	1.6	3.4
SP-5 (5.5-6.5')	7.2	3.4
SP-5 (10-12')	5.2	3.7
SP-6 (1-2')	1.9	3.7
SP-6 (10-12')	6.3	3.7
SP-6 (16-18')	2.5	3.8
SP-7/SB1 (11-13')	3.9	3.9
SP-7/SB1 (17-19')	3.4	3.9
SP-8 (5-7')	4.1	3.9
SP-8 (14-16')	3.8	3.9

SP-9 (5-6)	3.9	4.1
SP-9 (8-10')	1.6	4.7
SP-9 (14-16')	3.7	4.7
SP-10/SB3 (5-7')	5.6	4.7
SP-10/SB3 (13-15')	2.4	4.9
SP-11 (4-6)	5.1	4.9
SP-12 (3-5')	6.7	5.1
SP-12 (9-11')	3.9	5.1
SP-13 (2-4')	3.7	5.2
SP-13 (12-14')	3.1	5.2
SP-15 (5-7')	42	5.3
SP-16 (6-8')	6.1	5.6
SP-16 (10-12')	2.7	5.7
SP-17 (10-12')	5.7	5.8
SP-17 (12-14')	3.4	6.1
SP-18 (14-16')	3.9	6.3
SP-18 (22-24')	3	6.7
SP-19 (2-4')	3.7	7.2
SP-19 (7-9')	4.7	8.5
SP-20 (5-7')	4.9	8.8
SP-20 (11-13')	2.4	12
SP-21 (6-8')	5.1	42

N=46
30th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Benzo (a) pyrene	(ug/kg)	soil
SB-P9-1-1	<330	<330
SB-P9-1-1	<330	<330
SB-P9-1-2	<330	<330
SB-P9-1-2	<330	<330
SB-P9-2-1	<330	<330
SB-P9-2-2	<330	<330
SB-P9-2-2	<330	<330
SB-P9-2-3	<330	<330
SB-P9-2-3	<330	<330
SB-P9-3-1	<330	<330
SB-P9-3-1	<330	<330
SB-P9-3-2	<330	<330
SB-P9-3-2	<330	<330
SB-P9-4-1	<330	<330
SB-P9-4-1	<330	<330
SB-P9-4-2	<330	<330
SB-P9-4-2	4,000	<330
SP-1 (4-6')	<330	<330
SP-1 (10-12')	<330	<330
SP-2 (4-6')	<330	<330
SP-2 (20-22')	<330	<330
SP-3 (2-4')	<330	<330
SP-3 (10-12')	<330	<330
SP-4 (6-8')	<330	<330
SP-4 (10-12')	<330	<330
SP-5 (5.5-6.5')	<330	<330
SP-5 (10-12')	<330	<330
SP-6 (1-2')	<330	<330
SP-6 (10-12')	<330	<330
SP-6 (16-18')	<330	<330
SP-7/SB1 (11-13')	<330	<330
SP-7/SB1 (17-19')	<330	<330
SP-8 (5-7')	<330	<330
SP-8 (14-16')	<330	<330
SP-9 (5-6)	<330	<330
SP-9 (8-10')	<330	<330
SP-10/SB3 (5-7')	<330	<330
SP-10/SB3 (13-15')	<330	<330
SP-11 (4-6)	<330	<330
SP-12 (3-5')	<330	<330
SP-12 (9-11')	<330	<330
SP-13 (2-4')	<330	<330
SP-13 (12-14')	350	<330
SP-15 (5-7')	<330	<330
SP-16 (6-8')	<330	<330
SP-16 (10-12')	<330	<330
SP-17 (10-12')	<330	<330
SP-17 (12-14')	<330	<330
SP-18 (14-16')	<330	<330
SP-18 (22-24')	<330	<330
SP-19 (2-4')	<330	<330
SP-19 (7-9')	<330	<330
SP-20 (5-7')	<330	<330
SP-20 (11-13')	<330	350
SP-21 (6-8')	<330	4,000

N=55
36th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Acenaphthene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	180	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	180

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Anthracene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	100	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	110 J	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	5 J	<5
SP-14	18 J	<5
SP-16	<5	<5
SP-17	<5	5 J
SP-18	<5	18 J
SP-19	<5	100
SP-20	<5	110 J

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Barium (dissolved)	(ug/L)	gw
TW-P9-4-1	<200	<200
TW-P9-4-2	<200	<200
SP-1	<200	<200
SP-3	<200	<200
SP-4	<200	<200
SP-5	<200	<200
SP-6	<200	<200
SP-7/SB1	<200	<200
SP-8	380 J	<200
SP-9	<200	<200
SP-10/SB3	<200	<200
SP-11	<200	<200
SP-12	270 J	230 J
SP-13	350 J	250 J
SP-14	500 J	270 J
SP-16	340 J	340 J
SP-17	250 J	350 J
SP-18	390 J	380 J
SP-19	<200	390 J
SP-20	230 J	500 J

N=20
15th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Benzo(a)anthracene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	190	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	190

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Benzo(b)fluoranthene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	190	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	190

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Benzo (k) fluoranthene	
TW-P9-1-1	<5
TW-P9-2-3	<5
TW-P9-3-2	<5
TW-P9-4-1	<5
TW-P9-4-2	79
TW-P9-5-1	<5
SP-1	<5
SP-3	<5
SP-4	<5
SP-5	<5
SP-6	<5
SP-7/SB1	<5
SP-8	<5
SP-9	<5
SP-10/SB3	<5
SP-11	<5
SP-12	<5
SP-13	<5
SP-14	<5
SP-16	<5
SP-17	<5
SP-18	<5
SP-19	<5
SP-20	<5
	79

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Benzo(a) pyrene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	160	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	160

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Chrysene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	210	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	210

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Copper (dissolved)	(ug/L)	(total)
TW-P9-4-1	20	<25
TW-P9-4-2	30	<25
SP-1	<25	<25
SP-3	<25	<25
SP-4	<25	<25
SP-5	<25	<25
SP-6	<25	<25
SP-7/SB1	<25	<25
SP-8	<25	<25
SP-9	<25	<25
SP-10/SB3	<25	<25
SP-11	<25	<25
SP-12	<25	<25
SP-13	<25	<25
SP-14	<25	<25
SP-16	<25	<25
SP-17	<25	<25
SP-18	<25	<25
SP-19	<25	20
SP-20	<25	30

N=20
15th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Cyanide	(ug/L)	(total)
SP-1	<3	<3
SP-3	<3	<3
SP-4	<3	<3
SP-5	<3	<3
SP-6	<3	<3
SP-7/SB1	<3	<3
SP-8	<3	<3
SP-9	<3	<3
SP-10/SB3	<3	<3
SP-11	<3	<3
SP-12	<3	<3
SP-13	160	<3
SP-14	470	<3
SP-16	<3	<3
SP-17	29	<3
SP-18	<3	29
SP-19	<3	160
SP-20	<3	470

N=18
14th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Fluoranthene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	430	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	150 J	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	11 J	<5
SP-14	10 J	<5
SP-16	<5	<5
SP-17	<5	10 J
SP-18	<5	11 J
SP-19	<5	150 J
SP-20	<5	430

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Indeno (1,2,3-cd) Pyre	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	110	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	110

N=24
17th Ranked Value is appropriate for
Nonparametric Confidence Interval
with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Naphthalene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	74	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	<5	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	<5	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	<5
SP-19	<5	<5
SP-20	<5	74

N=24
 17th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%

PCBs	(ug/L)	gw
SP-1	<0.2	<0.2
SP-3	<0.2	<0.2
SP-4	<0.2	<0.2
SP-5	<0.2	<0.2
SP-6	<0.2	<0.2
SP-7/SB1	3.1	<0.2
SP-8	<0.2	<0.2
SP-9	<0.2	<0.2
SP-10/SB3	<0.2	<0.2
SP-11	<0.2	<0.2
SP-12	<0.2	<0.2
SP-13	<0.2	<0.2
SP-14	0.2	<0.2
SP-16	<0.2	<0.2
SP-17	<0.2	<0.2
SP-18	<0.2	<0.2
SP-19	<0.2	0.2
SP-20	<0.2	3.1

N=18
 14th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%

Phenanthrene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	580	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	68	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	6	<5
SP-14	7	<5
SP-16	<5	<5
SP-17	<5	6
SP-18	<5	7
SP-19	<5	68
SP-20	<5	580

N=24
 17th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%

Former Building 9
Statistical Analysis of Constituents Exceeding Criteria
Nonparametric Confidence Interval of 95 %
all concentrations are in ug/L

Pyrene	(ug/L)	gw
TW-P9-1-1	<5	<5
TW-P9-2-3	<5	<5
TW-P9-3-2	<5	<5
TW-P9-4-1	<5	<5
TW-P9-4-2	780	<5
TW-P9-5-1	<5	<5
SP-1	<5	<5
SP-3	<5	<5
SP-4	<5	<5
SP-5	<5	<5
SP-6	100	<5
SP-7/SB1	<5	<5
SP-8	<5	<5
SP-9	<5	<5
SP-10/SB3	<5	<5
SP-11	<5	<5
SP-12	<5	<5
SP-13	<5	<5
SP-14	6	<5
SP-16	<5	<5
SP-17	<5	<5
SP-18	<5	6
SP-19	<5	100
SP-20	<5	780

N=24
 17th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%

Trichloroethylene	(ug/L)	gw
TW-P9-3-2	71	0.5
TW-P9-5-2	0.5	2
MW-P9-3-3	350	2.5
MW-P9-5-4	15	2.5
MW-P9-5-5	110	3
SP-1	3	3
SP-3	12	6
SP-4	370	8
SP-5	28	10
SP-6	12	10
SP-7/SB1	270	12
SP-8	250	12
SP-9	8	15
SP-10/SB3	42	28
SP-11	2	42
SP-12	2.5	69
SP-13	3	71
SP-14	2.5	110
SP-16	10	180
SP-17	6	250
SP-18	180	270
SP-19	69	350
SP-20	10	370

N=23
 17th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%

1,1,1-Trichloroethane	(ug/L)	gw
TW-P9-3-2	<1	<1
TW-P9-5-2	<1	<1
SP-1	<1	<1
SP-3	<1	<1
SP-4	69	<1
SP-5	26	<1
SP-6	<1	<1
SP-7/SB1	280	<1
SP-8	<1	<1
SP-9	<1	<1
SP-10/SB3	<1	<1
SP-11	<1	<1
SP-12	<1	<1
SP-13	16	<1
SP-14	<1	<1
SP-16	<1	16
SP-17	<1	26
SP-18	77	69
SP-19	<1	77
SP-20	<1	280

N=20
 15th Ranked Value is appropriate for
 Nonparametric Confidence Interval
 with UCL 95%